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Statistical Studies of Heart Disease

V. Illness from Heart and Other Cardiovascular-renal Diseases Recorded in General Morbidity Surveys of Families

By Selwyn D. Collins, Ph. D.*

Heart disease, the largest single category in the cardiovascular-renal [1] diseases, is by far the most frequent of all causes of death. Hypertension and arteriosclerosis rank low as recorded primary causes of death in the United States, but intracranial lesions of vascular origin, usually preceded by hypertension or arteriosclerosis or both, are important causes of death. Nephritis in terms of numbers of deaths is roughly equivalent to intracranial lesions. The three causes combined under the general title of cardiovascular-renal diseases, made up 48 percent of all deaths in the United States in the 2 years, 1945 and 1946. These causes accounted for 10 percent of all deaths at 15–24 years; 30 percent at 35–44; 52 percent at 55–64; and 66 percent at 75–84 years of age. Thus in the older ages they constitute a very large proportion of the deaths from all causes.

At least three criteria measure the importance of a given disease as a cause of morbidity—annual cases or attacks per 1,000 persons observed, annual days of disability [2] per person observed, and days of disability per sick person. In terms of cases or attacks of illness, both disabling and nondisabling, the cardiovascular-renal diseases are

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[1] Cardiovascular-renal as used here refers to (*a*) heart disease, all forms except syphilitic and thyrotoxic; congenital is included with heart disease except in tables and charts noted to the contrary; (*b*) hypertension including intracranial lesions of vascular origin, high blood pressure, and arteriosclerosis; (*c*) nephritis, all forms, and other kidney diseases. While not an exact classification, it seemed the best that could be done with the available survey data.

[2] Disability as used throughout this paper means inability to: work in gainful employment or at home, do housework, attend school, or pursue other usual activities. Cases with any disability include those with intermittent disabilities of less than 7 consecutive days, but the majority of the disabling cases were disabled for 7 consecutive days or longer. The disabling category includes hospital cases and deaths before the 7th day of disability. See footnotes to table 1 for a detailed description of disability categories used in this study.

outstripped by the acute upper respiratory diseases. Because of the very large number of the latter cases, this respiratory group usually accounts for more days of disability per person under observation than do the cardiovascular-renal diseases, although at some of the older ages heart disease is the leading cause of disability in terms of days per person observed. In terms of days of disability per sick person, the cardiovascular-renal diseases rank high because of long durations. Heart disease is the most important of the cardiovascular-renal group.

In these diseases, as in other chronic and some acute conditions, an almost unmeasurable number of minor cases is unknown to the patient or to the family informant.

Data on mortality from heart disease are available in detailed classifications by the particular type of heart disease and by age, sex, geographic section, size of city, rural area, and other important classifications not only in the United States but also in many other countries. Data on illness from heart disease, however, are far less complete and usually far less detailed. Almost the only attempt to record heart disease morbidity in the United States on anything like a national scale was made in the National Health Survey of 1935–36. For various reasons the data from that survey were not analyzed in detail with respect to specific chronic diseases. Although the data pertain to a period more than a decade ago, it seems worth while to report more completely the results of that study in comparison with data collected in other ways.

Source and Character of Data

The National Health Survey (*2*, *14*, *17*) consisted of a single-visit house-to-house canvass conducted in 83 cities and towns in 18 States by different groups of personnel in each city but with careful supervision from a national headquarters as well as general and immediate supervision from regional, State, and local offices. Even under these circumstances, a single canvass with inquiries about the whole of the preceding year would not record all illness. However, more complete data could be expected for disabling chronic diseases in the cardiovascular-renal group because of their long duration and the considerable disability associated with them.

Data were recorded in the terms reported by the informant, who was usually the housewife, or, in her absence, some other responsible adult member of the household. However, a large subsample of the diagnoses was sent to attending physicians, clinics, and hospitals for verification. The general results of this procedure are presented in some detail in the appendix to this paper.

The morbidity data were supplemented by mortality recorded for

the surveyed group in the study year 1935–36, and for the continental United States registered for the years 1936 and 1945–46, the last final reports that were available.

Selection of the Main Sample

The selection of the cities and of the enumeration districts within the cities which were canvassed are discussed in detail in a prior publication (*14*). Briefly, the survey covered approximately 700,000 households in 83 cities and towns as small as 5,000 in population. The total surveyed population was distributed roughly as the total population of the United States with respect to broad geographic sections and size of city. The 52 cities under 100,000 were, with one exception, completely canvassed, but those over 100,000 had differing sampling ratios. The sample areas were United States census enumeration districts selected by a random process from the total of such districts in the city. Enumeration districts range from 1,000 to 3,000 or more population, but for this survey districts of 2,000 to 3,000 were subdivided into two parts, and those with 3,000 or more population were subdivided into three parts, each part being considered as a separate district in selecting the areas to be canvassed.

Total Cases of the Several Types

Table 1 shows for each of the three diagnoses and for the total cardiovascular-renal diseases the case rates per 100,000 surveyed population, the percentage of cases attended by a doctor during the study year, and the total number of cases recorded. The total cases for heart disease refer to all persons for whom a diagnosis of heart disease of any type was reported, regardless of what other diseases or complications the patient suffered during the year. However, each case of heart disease represents a different individual; the relatively few second or later attacks for the same person during the year were eliminated.[3] Thus the different types of cases and rates are additive to obtain total case rates with any disability and total recorded cases.

The same is true of the hypertension group, and of nephritis; however, the cases of the three diseases are not additive to the total cardiovascular-renal cases because a patient with heart disease may also have had hypertension or nephritis or both.. In the columns labeled "cardiovascular-renal diseases", cases in which the same individual had two or more of the three diseases are included only once. Cases involving heart disease, hypertension, or nephritis complicated by some diagnosis other than one of these three are all included, regardless of the relative importance of the other diagnosis involved.

Of the total cardiovascular-renal cases with disability of 7 con-

[3] Second and later attacks for the same individual during the study year amounted to heart, 253 cases; hypertension, 104 cases; and nephritis, 88 cases; with a cardiovascular-renal unduplicated total of 393 cases. The 20 heart deaths and 11 hypertension deaths among these cases were retained as fatal cases.

Table 1. *Cases of heart disease, hypertension, nephritis, and cardiovascular-renal diseases classified by onset and disability—2,500,000 persons of all ages in 83 cities and towns in 18 States, 1935–36*

Description of case [1]	Cases per 100,000 persons observed				Percent of cases attended by a doctor [3]				Total number of cases			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
Total with any disability during year	913	722	322	1,638	90.8	92.6	89.4	90.4	22,699	17,957	8,011	40,719
Onset [2] within study year and disabled 7+ days	507	419	218	964	95.7	97.1	93.8	95.5	12,607	10,428	5,417	23,972
No previous attack (new cases)	251	237	118	518	96.1	97.6	95.2	96.2	6,237	5,886	2,943	12,877
Previous attack (recurrences)	256	183	99	446	95.3	96.5	92.1	94.6	6,370	4,542	2,474	11,095
Onset [2] prior but disabled during year	406	303	104	673	84.7	86.4	80.1	83.1	10,092	7,529	2,594	16,747
Disabled 7 or more consecutive days	212	149	60	335	91.2	92.2	90.5	90.2	5,264	3,712	1,487	8,329
Intermittent less than 7 consecutive days	194	154	45	339	77.6	80.7	66.0	76.1	4,828	3,817	1,107	8,418
Nondisabling residuals of previous cases	997	1,155	275	2,132	51.4	54.7	41.5	49.9	24,791	28,716	6,839	53,014
With restriction of activity during year	248	198	49	416	60.4	65.5	50.9	59.2	6,166	4,913	1,228	10,344
Without restriction of activity during year	749	957	226	1,716	48.4	52.4	39.4	47.7	18,625	23,803	5,611	42,670
Total with any disability or restriction	1,161	920	372	2,054	84.3	86.8	84.2	84.1	28,865	22,870	9,239	51,063
Total recorded cases of any kind [4]	1,910	1,877	597	3,769	70.2	69.3	67.3	67.5	47,490	46,673	14,850	93,733

[1] Cases of each of the 3 broad diagnoses include that diagnosis as a sole, primary, or contributory cause. Duplicate attacks of the same disease in the same individual during the study year are excluded, so that each case represents a different individual. The total for cardiovascular-renal diseases is the total of the 3 diseases minus cases representing a second or third disease (of the 3 herein considered) in the same individual.

[2] Onset refers to the date of beginning of disability due to this attack. Disability means inability to attend school, work in gainful employment or at home, or pursue other usual activities. Cases with onset within the study year were nearly all disabled for 7 consecutive days or longer but this category includes deaths before the 7th day, hospital cases, and a few cases disabled on the day of the visit who had not been disabled for 7 consecutive days. This category also includes some cases with an unknown number of days disabled (less than 1 percent in each diagnosis) that were excluded from tables 9 and 10 which deal with mean disabling durations and distributions of cases by duration.

[3] For disabling illness (except intermittent), attendance refers to a doctor during that attack; for nondisabling and intermittent cases attendance refers to a doctor within the study year. Hospital inpatients with care by the hospital staff only are included here as attended, but are not counted in table 13 as having home, office, or clinic calls.

[4] Following is a description of the specific types of cases used in this and other tables:

I. Serious disability: Cases disabling for 7 consecutive days or longer, including deaths before the 7th day, hospital cases disabled less than 7 days and cases disabled on the day of the visit with less than 7 days of disability.
- (1) New cases: Disability of 7 consecutive days or longer with onset of disability within the study year and no history of any previous attack.
- (2) Recurrent cases: Disability of 7 consecutive days or longer with onset of disability within the study year but with a history of one or more attacks (disabling or nondisabling) prior to the study year.
- (3) Onset prior: Disabled at beginning of study year with further disability of 7 consecutive days or longer within the study year.

II. Disability of less than 7 consecutive days:
- (4) Intermittent disability: Cases with no disabling attack of 7 consecutive days or longer during the study year but with 1 or more disabling attacks of less than 7 consecutive days; the aggregate days of disability from such attacks is sometimes fairly large.

III. Nondisabling:
- (5) Restricted activity: Cases with no disability but some restriction of activity such as ability to do light work only or nonparticipation in athletics.
- (6) Nondisabling: Cases with no disability and no restriction of activity at any time during study year

secutive days or longer, 94 percent were attended by a doctor; corresponding figures for the three diagnoses were 94, 96, and 93 percent for heart disease, hypertension, and nephritis, respectively. Nearly half (48 percent) of the cardiovascular-renal nondisabling [4] cases with no restriction of activity had seen a doctor within a year, and of the nondisabling with some restriction of activity, 59 percent had seen a doctor within that time. It seems probable, therefore, that most of the cases recorded in this study involved a period of severe illness either during or preceding the study year, rather than a physical examination finding without disabling illness.

The cardiovascular-renal cases which suffered 7 or more consecutive days of disability during the year (average 126 days per case) were probably recorded with reasonable completeness. Evidence of this fact is found by comparing the survey rates of 7 days or more disability for males with the findings of Gafafer (*9*) for cases disabling 8 days or longer among members of industrial sick benefit associations. Gafafer's data for the years 1940–46, represent nearly 500,000 male-years of membership for working people of roughly 20–64 years of age, with a few below and above those ages. In the household survey, the heart disease attack rate (exclusive of any overlap with the other two diagnoses) with onset of disability within the study year was 397 cases per 100,000 for males 20–64 years, as compared with 455 for the sick benefit associations. Corresponding figures for hypertension were 212 for the canvass group and 168 for sick benefit members, and for nephritis, 166 as compared with 128 per 100,000 sick benefit members. For the total cardiovascular-renal group the canvass rate was 774 cases per 100,000 males as compared with 751 for sick benefit members. The rates in the two sets of data are of the same order of magnitude and actually higher for the hypertension group and nephritis. The canvassed population, however, would include the chronically disabled and might be expected to have higher rates than the working population.[5]

Nondisabling cases in the household canvass were obtained by an inquiry about a considerable number of specific chronic diseases in which a record was made of the presence of the disease regardless of disability. Such a record, however, would miss many cases that would

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[4] Of the total heart cases that were either nondisabling or had only intermittent disabilities of less than 7 consecutive days, 4.5 percent (1,059 nondisabling and 233 intermittent) reported the total duration of the disease was less than 12 months. Corresponding figures were 5.7 percent (1,652 nondisabling and 187 intermittent) for hypertension; 5.4 percent (366 nondisabling and 64 intermittent) for nephritis; and 5.1 percent (2,678 nondisabling and 441 intermittent) for the total cardiovascular-renal group. These cases with little or no disability were not counted with the new cases because they did not represent an attack in the sense of the new 7-day disabling cases. For further data on inclusions in each disability category, see footnotes to table 1, and for further data on total durations of symptoms, see table 12, section 2.

[5] Average durations in days of disability per case for males 20–64 years of age in the canvassed families were 136, 127, 91, and 122 for heart, hypertension, nephritis, and the whole cardiovascular-renal group, respectively, as compared with 107, 99, 56, and 96 among the members of sick benefit associations.

be recorded by even a superficial examination with a stethoscope or sphygmomanometer, not to mention the use of an electrocardiograph. Indeed, heart disease and hypertension are frequently found on examination of individuals who had no knowledge that they had such conditions.[6]

Throughout this report the data are presented as recorded, without correction of any kind. The appendix, however, includes a discussion of methods of correcting for under-reporting and rough estimates of total cases in the United States at the present time.

Relative Importance of Each Diagnosis in the Cardiovascular-Renal Case Load

As already noted, the method of counting and tabulating included as a heart disease case, for example, any individual for whom such a diagnosis was reported, whether it was the most important or the least important of the diagnoses. In general, the importance of the diagnosis in a given illness was tabulated in accordance with the report of the family informant as to which diagnosis had the longest disabling duration or, in the absence of any difference between the durations, which diagnosis was the most important as a cause of this disabling illness. Each of the other two diagnoses was tabulated in the same way.

This method of counting diagnoses leads to some overlapping among the three diagnosis groups considered in the study. To avoid this situation, the total number of cases of cardiovascular-renal diseases was determined by eliminating those cases of each of the three diagnoses which were contributory to one or both of the other two diagnoses and totaling the cases with only one of the three diseases and those with what was considered the principal of two or all three of the diseases. This process leads to an unduplicated total of cardiovascular-renal cases.

Table 2 shows for each diagnosis the percentage of cases in which one or both of the other diagnoses were also present. Thus, among the heart cases with 7 or more consecutive days of disability, 17.5 percent reported hypertension as another diagnosis on the case, 2.4 percent reported both hypertension and nephritis, and 5.4 percent reported only nephritis. Among the nondisabling cases the percentages were not far different, 16.2, 0.9, and 2.2, respectively, each one lower than for the 7-day disabling cases. Similar data for hypertension and neph-

[6] In an intensive survey (4) with monthly visits to families in a section of Baltimore, comparable prevalence rates for all recorded cases of heart disease were 75 percent higher than found in the present study, 49 percent higher for hypertension, 107 percent higher for nephritis, and 55 percent higher for the unduplicated total of cardiovascular-renal diseases. Corresponding figures for cases with any disability during one year were 41 percent higher for heart, 45 percent higher for hypertension, 72 percent higher for nephritis and 28 percent higher for cardiovascular-renal diseases.

Table 2. *Percentage of cases [1] of each of the 3 diagnoses that were complicated by another disease of the cardiovascular-renal group—all types of survey cases of all ages in 83 cities and towns in 18 States, 1935–36*

Sex and type of case	Heart disease complicated by—			Hypertension complicated by—			Nephritis complicated by—		
	Hypertension only	Hypertension and nephritis	Nephritis only	Heart disease only	Heart disease and nephritis	Nephritis only	Heart disease only	Heart disease and hypertension	Hypertension only
Disabling for 7 consecutive days or longer:									
Both sexes	17.5	2.4	5.4	24.7	3.2	4.1	13.6	5.9	6.6
Male	16.4	2.4	5.7	26.9	3.8	4.7	15.3	6.6	7.2
Female	18.6	2.3	5.1	23.1	2.8	3.7	12.1	5.4	6.2
Nondisabling and intermittent disabilities of less than 7 consecutive days:									
Both sexes	16.2	.9	2.2	15.1	.9	2.4	8.3	3.3	9.4
Male	13.0	.7	2.1	14.9	.8	2.6	6.7	2.3	6.6
Female	18.0	1.0	2.2	15.2	.9	2.3	9.5	4.0	11.3

[1] Cases of each diagnosis include those classed as the sole, primary, or contributory cause of the illness.

ritis show larger differences between the 7-day disabling cases and the nondisabling cases.

Proportions of Cases and Deaths of Each Diagnosis in the Total Cardiovascular-renal Group

Considering the proportion of deaths from the three causes that make up the total cardiovascular-renal mortality, heart disease accounts for 64 percent, hypertension 23 percent, and nephritis 13 percent for all ages. Considering corresponding percentages for the unduplicated counts of cases that make up the total cardiovascular-renal case-load, heart disease accounts for 45 percent, hypertension 42 percent, and nephritis 13 percent. These percentages for all ages are the same whether or not congenital heart disease is included in the computation. The case data may be further subdivided: of the total cardiovascular-renal cases for all ages, 39.8 percent reported heart disease only, 7.9 percent heart with hypertension, 38.6 percent hypertension only, 1.6 percent hypertension and nephritis, and 12.1 percent nephritis only.

Figure 1 shows by 5-year age groups the proportions of the unduplicated count of cardiovascular-renal cases that were heart disease only, hypertension only, and nephritis only; it also shows the proportions of cases with diagnoses of both heart disease and hypertension, and of cases with both hypertension and nephritis, including in both groups a few cases with heart disease and nephritis separated according to which disease was the principal cause of the illness. More searching inquiry of the informant or more extensive verification by attending physicians probably would have revealed more of these

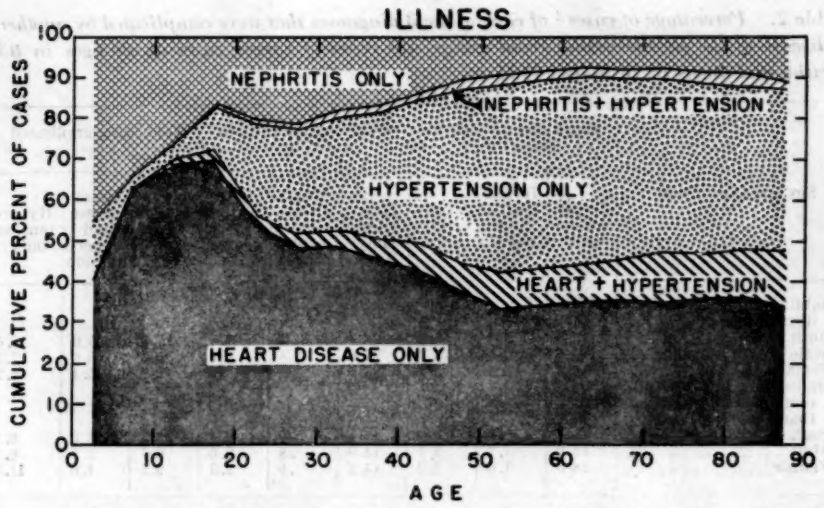

Figure 1. Proportion of all recorded cases of cardiovascular-renal diseases reported as due to each of the three diagnoses and to combinations of these diagnoses, by 5-year age groups—canvassed families in 83 cities and towns, 12 months, 1935–36 (congenital heart excluded).

cases with two or more cardiovascular-renal diseases, but the recorded proportions seem worth reporting.

Although in this study congenital heart disease is usually included with other heart diseases, for this particular chart and figure 2 it seemed better to eliminate congenital from consideration. Of the total cardiovascular-renal cases under 5 years of age, only 40 percent

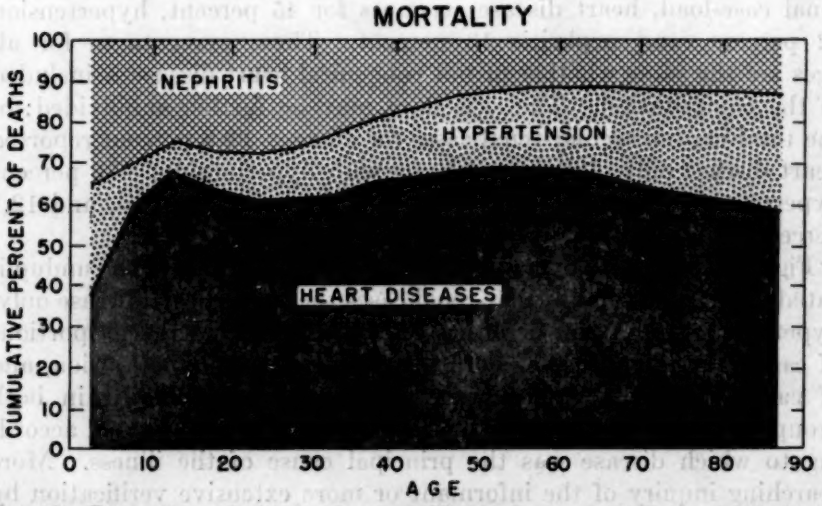

Figure 2. Proportion of deaths from cardiovascular-renal diseases classified as primarily due to each of the three diagnoses, by 5-year age groups—registered deaths in the total United States, 2 years, 1945 and 1946 (congenital heart excluded).

represented heart diseases without hypertension or nephritis (51 percent, if congenital is included). From the 40 percent starting point, the proportion of cases with heart disease alone increases rapidly to a maximum of 70 percent at 15–19 years of age when rheumatic heart disease is important. Above 20 years the proportion decreases moderately to a minimum of 33 percent at 50–54 with a slight rise to 36 percent at 80–84. The percentage of cardiovascular-renal cases reporting both heart disease and hypertension ranges from practically zero under 15 years to 13 percent at 85 years and over.

The decrease in the proportion of heart disease only in the adult ages is largely accounted for by an increase in hypertension only and in heart with hypertension also. These two groups amount to very little for the ages under 20, but after 50 years they account for more than half of all cardiovascular-renal cases. Nephritis, on the other hand, amounts to 45 percent at ages under 5 years (37 percent, if congenital heart is included), declining to 17 percent at 15–19 years, after which there is a small increase followed by a gradual decrease to 10 percent at 55–59 years with not much change thereafter. Nephritis with hypertension is almost negligible in these data, the maximum percentage at 80–84 years amounting to 2.6 percent of all cardiovascular-renal cases at that age.

Figure 2 is set up in a similar way but pertains to deaths in the United States for the 2 years, 1945 and 1946. Heart disease accounts for 38 percent of the cardiovascular-renal deaths under 5 years of age (91 percent, if congenital heart is included). From the low figure of 38 percent it rises to 67 percent at 10–14 years, after which it fluctuates between 61 and 69 percent, except at 85 years and over when it drops to 58 percent. For hypertension (including high blood pressure, intracranial vascular lesions, and arteriosclerosis), the deaths in this group are rather largely accounted for by intracranial vascular lesions, whereas the great majority of the cases of illness are hypertension of a less severe degree. For the ages under 5 years this hypertension group of deaths amounts to 26 percent of the total cardiovascular-renal deaths (4 percent if congenital heart is included); after 5 years it accounts for only about 10 percent up to 20 years of age, with a gradually increasing proportion up to 29 percent at 85 years and over. Nephritis deaths amount to 36 percent of the cardiovascular-renal deaths for the ages under 5 years (5 percent if congenital heart is included) with a general decline in the percentage to 11 at 60–64 years, after which there is a slight increase to 13 percent at 85 years and over. Thus in terms of deaths, heart disease is a considerably more important part of the total cardiovascular-renal group than in terms of prevalent cases.

Age Incidence and Prevalence [7] of Each Disease by Onset and Disability

The charts of age variation are presented on a semi-logarithmic grid. Moreover, each chart shows an excessive number of curves in the same field. This mode of presentation was selected to facilitate comparison of (*a*) the shape of the age curves for the different severity categories of the given diagnosis; (*b*) the relative differences at specific ages between rates for the various types; and (*c*) the relative increase with age in the rates for a given severity category in different periods of life. No other type of chart would make these comparisons as easy as the semi-logarithmic grid used for plotting age specific rates in this paper.

Age Variation in Prevalence Rates

Figure 3 shows for the three diseases and the total cardiovascular-renal group prevalence rates for all cases with any disability, including the relatively small group who suffered intermittent disabilities during the year but none with a duration of as much as 7 consecutive days (tables 3, 4, 5, 6). On the right half of the chart, incidence curves are shown for new cases—that is, cases disabling for 7 consecutive days or longer with onset of disability within the study year for patients who reported that they had never before suffered an attack of the disease.

For the disabling prevalent cases, hypertension shows the greatest variability with age, ranging from a low of 17 per 100,000 population at 5–9 years to a maximum of 9,625 for persons over 85 years of age. The hypertension rate for disabling cases does not reach the level of nephritis, the lowest of the other diseases, until nearly 40 years of age and the level of heart disease until about 75 years, but for the three age groups above 75 years the hypertension rate slightly exceeds the heart rate. Heart disease rates are higher at 10–14 years than in the next three age groups, reflecting the higher incidence of heart disease complicating or following rheumatic fever at these early ages. For new disabling cases with no history of previous attack, the general situation is the same, but the rate for hypertension is slightly but consistently greater than for heart disease in the six age groups above 60 years. Above 40 years nephritis has the lowest of the three rates, the maximum for new cases being 996 per 100,000 at ages 85 and over. For heart disease the rate of new cases at 5–9 years exceeds the five other age groups below 30 years.

[7] The word prevalence is used in this study in the usual sense of the number of cases or the proportion of the population with a case on a given day. Since the diseases under consideration are all chronic, the concept is broadened to include all cases existing at any time during the study year as a better measure of the extent of illness from these causes. New cases, however, represent incidence of disabling cases but they are also included in the broader definition of prevalence

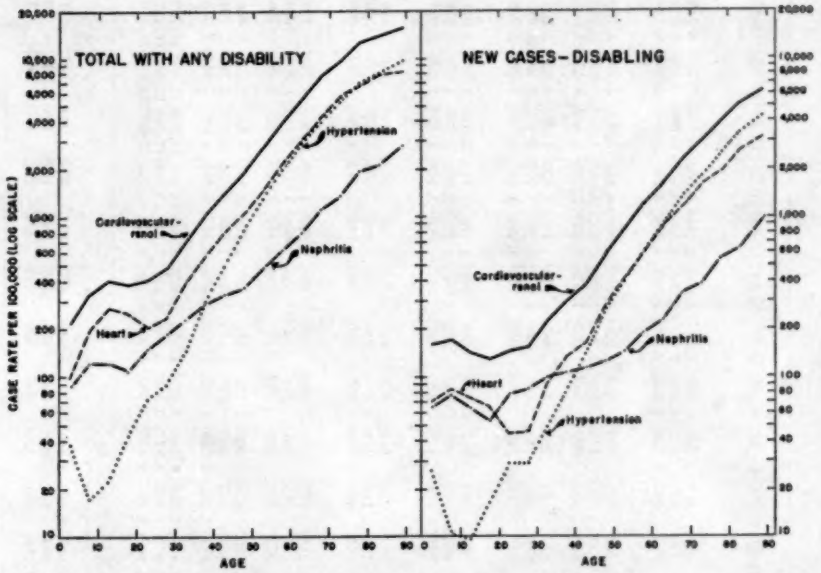

Figure 3. Age prevalence of all disabling cases and age incidence of new cases disabling for 7 consecutive days or longer for all cardiovascular-renal diseases and for each of the three diagnoses—canvassed families in 83 cities and towns, 12 months, 1935–36 (sole, primary, and contributory causes).

The following table gives in broad age-groups case rates per 100,000 population for new cases disabling for 7 consecutive days or longer (onset of disablity within study year and no previous attack), and for all new cases including those with and without disability (total duration of symptoms less than 12 months prior to day of visit). (See footnote 4 for numbers of nondisabling new cases.)

Type of case	All ages			Both sexes, by age				Number of cases, all ages
	Both sexes	Male	Female	Under 20	20–44	45–64	65 and over	
New cases per 100,000								
Heart disease:								
New 7-day disabling cases	251	263	240	73	94	488	1,598	6,237
All new cases including nondisabling	303	300	305	100	138	569	1,752	7,529
Hypertension:								
New 7-day disabling cases	237	209	262	15	65	481	1,917	5,886
All new cases including nondisabling	311	257	360	22	121	652	2,168	7,725
Nephritis:								
New 7-day disabling cases	118	112	125	65	96	163	435	2,943
All new cases including nondisabling	136	128	143	75	113	186	475	3,373
Cardiovascular-renal:								
New 7-day disabling cases	518	496	538	149	238	961	3,148	12,877
All new cases including nondisabling	643	587	695	192	344	1,196	3,513	15,996

In each diagnosis the percentage that the nondisabling new cases added to the new 7-day disabling cases was definitely greater for persons under 45 years than for those above that age, with the minimum percentage additions in the ages over 65 years. With the exception of nephritis, the nondisabling new cases added larger percentages to the new 7-day or longer disabling cases for females than for males of each age group. Nephritis showed the lowest percentage additions, which were roughly the same for males and females of corresponding ages.

Table 3. *Age and sex incidence and prevalence [1] of heart disease cases [3] (all forms) per 100,000 among 2,500,000 persons in 83 cities and towns in 18 States, 1935–36*

Type of case and onset of disability [2]	All ages		Age																	
	Number cases	Rate	Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85 and over
Total with any disability during year:																				
Both sexes	22,699	913	100.5	199.8	271.3	252.0	206.7	235.7	391	583	808	1,075	1,493	2,227	3,054	4,289	5,680	6,687	7,730	8,219
Male	10,241	858	118.2	207.0	262.3	255.1	142.1	154.5	227	436	677	975	1,355	2,245	3,239	4,540	6,211	6,940	8,282	8,372
Female	12,458	964	82.2	192.4	280.2	249.2	260.0	303.8	537	717	935	1,174	1,631	2,210	2,889	4,074	5,253	6,485	7,347	8,128
Onset [2] within study year and disabled for 7 or more consecutive days:																				
Both sexes	12,607	507	81.5	124.3	135.0	126.5	95.4	118.5	202	292	401	580	849	1,221	1,756	2,393	3,234	3,958	4,920	5,759
Male	5,809	487	103.3	128.5	129.4	138.5	61.2	80.2	128	230	346	552	809	1,240	1,856	2,467	3,545	4,069	5,635	5,980
Female	6,798	526	59.1	120.0	140.6	115.6	123.5	150.7	268	348	454	609	889	1,203	1,668	2,330	2,983	3,869	4,424	5,627
No previous attack (new cases):																				
Both sexes	6,237	251	72.1	84.8	71.3	66.2	44.6	45.9	94	136	163	282	420	607	872	1,154	1,603	1,929	2,623	3,202
Male	3,141	263	89.6	87.3	72.3	77.8	33.6	37.1	71	114	150	316	456	664	1,007	1,297	1,797	2,155	3,103	3,640
Female	3,096	240	53.9	82.3	70.3	55.7	53.6	53.2	115	157	176	249	383	552	753	1,031	1,447	1,749	2,291	2,938
Onset [2] prior but disabled during year:																				
Disabled 7 or more consecutive days:																				
Both sexes	5,264	212	15.2	31.6	47.7	57.2	40.5	38.8	63	105	169	221	310	563	766	1,160	1,544	1,826	1,970	2,011
Male	3,007	252	12.4	36.3	48.2	56.9	44.4	37.1	51	103	185	269	363	755	1,025	1,581	2,061	2,295	2,076	1,872
Female	2,257	175	18.0	26.8	47.1	57.4	37.4	40.1	73	107	153	173	256	381	537	800	1,128	1,453	1,896	2,094
Intermittent disabilities of less than 7 consecutive days:																				
Both sexes	4,828	194	3.8	43.9	88.6	68.4	70.8	78.4	127	187	239	273	334	442	531	736	902	903	840	449
Male	1,425	119	2.5	42.2	84.8	59.8	36.5	37.1	49	104	146	154	183	250	358	492	605	576	570	520
Female	3,403	263	5.1	45.6	92.5	76.2	99.1	113.0	196	262	329	392	485	626	684	944	1,142	1,164	1,027	406
Nondisabling residuals of previous cases:																				
With restriction of activity during year:																				
Both sexes	6,166	248	11.4	45.4	89.1	115.2	81.1	114.5	151	215	277	314	385	568	731	1,010	1,226	1,480	1,288	722
Male	2,192	184	10.0	42.2	86.5	118.6	56.2	78.2	70	147	218	201	256	390	563	808	1,039	1,180	1,300	676
Female	3,974	307	12.8	48.6	91.6	112.2	101.5	144.9	223	277	335	426	514	738	880	1,182	1,376	1,720	1,280	750
Without restriction of activity during year:																				
Both sexes	18,625	749	56.3	200.8	271.3	355.1	369.8	425.5	546	690	850	960	1,138	1,581	2,037	2,706	3,143	3,690	3,370	2,850
Male	6,687	560	66.0	216.8	266.8	297.8	280.3	279.6	349	488	625	640	771	1,169	1,614	1,993	2,556	3,224	3,263	2,704
Female	11,938	924	46.2	184.5	275.8	406.8	443.6	547.8	721	874	1,067	1,279	1,507	1,972	2,412	3,317	3,615	4,062	3,444	2,938
Total recorded cases of any kind:																				
Both sexes	47,490	1,910	168.1	445.9	631.7	722.3	657.7	775.8	1,088	1,489	1,935	2,348	3,016	4,375	5,822	8,005	10,049	11,857	12,388	11,792
Male	19,120	1,601	194.1	466.0	615.7	671.5	478.6	512.2	645	1,071	1,520	1,817	2,382	3,804	5,417	7,341	9,806	11,343	12,845	11,752
Female	28,370	2,195	141.3	425.5	647.6	768.2	805.1	996.5	1,481	1,867	2,337	2,879	3,652	4,920	6,181	8,573	10,244	12,267	12,071	11,816
			Population [4] in hundreds																	
Both sexes	24,866	.....	1,582	2,027	2,245	2,222	2,244	2,244	2,012	2,069	1,892	1,661	1,375	1,010	821	617	408	243	107	51
Male	11,940	.....	804	1,019	1,121	1,054	1,013	1,023	947	984	931	830	688	493	385	285	182	108	44	19
Female	12,927	.....	779	1,008	1,124	1,168	1,231	1,221	1,065	1,085	961	831	686	518	435	333	226	135	63	32

[1] [2] See footnotes 1 and 2 on table 1.

[3] Heart disease refers to all types, including congenital and chronic rheumatic but not rheumatic fever; and excluding syphilitic and thyrotoxic.

[4] Infants born during study year are counted as averaging 6 months of observation. For detailed populations above 5 years, see Pub. Health Rep. 58: 1590 (1943).

Table 4. *Age and sex incidence and prevalence [1] of hypertension cases per 100,000 among 2,500,000 persons in 83 cities and towns in 18 States, 1935–36*

Type of case and onset of disability [2]	All ages		Age																	
	Number cases	Rate	Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85 and over
Total with any disability during year:																				
Both sexes	17,957	722	37.3	17.3	22.7	41.9	73.5	89.1	146	300	496	831	1,336	2,034	2,896	4,208	5,330	6,963	8,094	9,625
Male	6,836	573	46.0	25.5	20.5	34.1	40.5	47.9	77	169	325	523	892	1,099	2,460	3,855	5,161	6,438	7,666	9,412
Female	11,121	860	28.3	8.9	24.9	48.8	100.7	123.6	207	418	662	1,138	1,781	2,353	3,282	4,510	5,465	7,382	8,390	9,753
Onset [3] within study year and disabled for 7 or more consecutive days:																				
Both sexes	10,428	419	31.6	14.8	17.8	29.7	45.4	52.6	83	151	251	467	735	1,128	1,639	2,413	3,214	4,255	5,564	6,794
Male	4,080	342	38.6	22.6	19.6	20.9	22.7	28.3	50	97	170	317	523	1,031	1,389	2,179	3,078	3,958	5,316	6,292
Female	6,348	491	24.4	6.9	16.0	37.7	64.2	72.9	113	200	330	616	949	1,221	1,860	2,613	3,323	4,492	5,736	7,096
No previous attack (new cases):																				
Both sexes	5,886	237	25.9	10.4	9.8	16.7	29.4	29.9	50	84	142	261	402	637	865	1,347	1,775	2,441	3,409	4,334
Male	2,494	209	31.1	15.7	8.0	13.3	13.8	21.5	36	68	114	196	330	633	789	1,325	1,775	2,434	3,331	3,692
Female	3,392	262	20.6	5.0	11.6	19.7	42.2	36.8	63	99	170	325	474	641	933	1,365	1,774	2,446	3,460	4,720
Onset [3] prior but disabled during year:																				
Disabled 7 or more consecutive days:																				
Both sexes	3,712	149	5.7	1.5	2.2	3.6	8.0	8.9	14	40	78	107	227	403	651	997	1,424	1,835	1,792	2,323
Male	1,910	160	7.5	2.9	------	5.7	11.8	7.8	13	37	80	104	222	447	755	1,216	1,698	1,997	1,848	2,704
Female	1,802	139	3.9	------	4.4	1.7	4.9	9.8	15	42	77	111	232	361	558	809	1,204	1,705	1,754	2,094
Intermittent disabilities of less than 7 consecutive days:																				
Both sexes	3,817	154	------	1.0	2.7	8.6	20.1	27.6	49	109	166	257	373	503	607	799	691	874	737	508
Male	846	71	------	------	.9	7.6	5.9	11.7	15	36	75	102	147	221	317	460	385	483	502	416
Female	2,971	230	------	2.0	4.4	9.4	31.7	40.9	79	176	255	411	600	771	864	1,088	938	1,186	901	563
Nondisabling residuals of previous cases:																				
With restriction of activity during year:																				
Both sexes	4,913	198	------	1.5	3.1	10.8	20.5	34.8	73	124	188	290	431	621	819	1,021	1,282	1,241	1,130	742
Male	1,382	116	------	2.9	2.7	7.6	14.8	20.5	42	57	113	153	208	329	519	703	885	873	730	572
Female	3,531	273	------	------	3.6	13.7	25.2	46.7	100	184	261	426	654	898	1,084	1,293	1,602	1,534	1,406	844
Without restriction of activity during year:																				
Both sexes	23,803	957	3.2	3.5	9.4	70.2	203.2	311.0	448	665	988	1,542	2,174	2,962	3,664	4,480	5,050	5,199	4,462	3,124
Male	6,909	579	3.7	1.0	7.1	49.3	153.9	220.9	317	436	573	852	1,140	1,705	2,203	2,783	3,281	3,790	3,285	2,548
Female	16,894	1,307	2.6	6.0	11.6	89.1	243.7	386.5	565	873	1,391	2,230	3,212	4,159	4,904	5,933	6,474	6,322	5,277	3,470
Total recorded cases of any kind:																				
Both sexes	46,673	1,877	40.5	22.2	35.2	122.9	297.2	434.9	667	1,089	1,672	2,662	3,941	5,617	7,379	9,709	11,662	13,403	13,686	13,491
Male	15,127	1,267	49.8	29.4	30.3	91.1	209.2	289.4	436	662	1,010	1,528	2,240	3,732	5,243	7,341	9,328	11,102	11,681	12,533
Female	31,546	2,440	30.8	14.9	40.0	151.6	369.6	556.8	872	1,476	2,313	3,794	5,647	7,410	9,270	11,736	13,541	15,239	15,073	14,067

[1] [2] See footnotes [1] and [2] on table 1. For population used see table 3. [3]

Table 5. *Age and sex incidence and prevalence [1] of nephritis cases per 100,000 among 2,500,000 persons in 83 cities and towns in 18 States, 1935–36*

Type of case and onset of disability [2]	All ages		Age																	
	Number cases	Rate	Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85 and over
Total with any disability during year:																				
Both sexes	8,011	322	87.2	121.8	120.7	108.0	148.8	183.6	231	291	336	364	479	628	792	1,138	1,373	1,962	2,175	2,811
Male	3,525	295	69.7	97.1	121.3	90.1	102.6	117.3	171	253	263	321	446	621	789	1,205	1,671	2,304	2,555	3,536
Female	4,486	347	105.3	146.8	120.1	124.2	186.8	239.1	284	325	407	407	511	635	795	1,079	1,133	1,690	1,912	2,376
Onset [3] within study year and disabled for 7 or more consecutive days:																				
Both sexes	5,417	218	77.1	106.0	94.9	86.9	121.6	138.6	170	208	221	255	311	404	492	682	770	1,121	1,307	1,718
Male	2,335	196	62.2	81.4	101.7	71.1	78.9	91.9	127	189	172	228	301	384	493	675	874	1,282	1,574	2,028
Female	3,082	238	92.5	130.9	88.1	101.1	156.8	177.7	208	225	268	283	321	423	492	689	686	993	1,122	1,532
No previous attack (new cases):																				
Both sexes	2,943	118	66.4	77.4	64.6	53.6	79.3	83.8	99	107	115	126	146	191	230	339	387	548	644	966
Male	1,333	112	53.5	66.7	69.6	43.6	57.2	63.5	80	102	98	124	153	189	254	355	462	678	753	936
Female	1,610	125	79.6	88.3	59.6	62.5	97.5	100.7	115	112	131	129	140	193	209	325	327	445	569	1,032
Onset [3] prior but disabled during year:																				
Disabled 7 or more consecutive days:																				
Both sexes	1,487	60	5.1	9.4	10.7	10.8	12.9	16.0	21	31	51	46	87	141	175	319	468	627	663	957
Male	810	68	6.2	11.8	8.9	13.3	13.8	14.7	16	25	49	47	94	175	202	411	671	818	776	1,300
Female	677	52	9.0	6.9	12.5	8.6	12.2	17.2	26	36	53	45	79	108	152	241	305	474	585	750
Intermittent disabilities of less than 7 consecutive days:																				
Both sexes	1,107	45	5.1	6.4	15.1	10.4	14.3	29.0	40	52	64	63	81	84	124	136	135	214	205	137
Male	380	32	1.2	3.9	10.7	5.7	9.9	10.8	29	39	42	46	51	63	93	119	126	204	205	208
Female	727	56	3.9	8.9	19.6	14.6	17.9	44.2	50	65	85	79	112	104	152	150	142	222	205	94
Nondisabling residuals of previous cases:																				
With restriction of activity during year:																				
Both sexes	1,228	49	3.2	9.9	16.5	9.5	15.6	22.7	27	48	49	56	79	109	156	217	287	293	280	371
Male	512	43	2.5	9.8	18.7	10.4	19.7	18.6	23	29	35	48	57	85	135	228	253	307	388	572
Female	716	55	3.9	9.9	14.2	8.6	12.2	26.2	31	65	62	64	101	131	175	207	314	282	205	250
Without restriction of activity during year:																				
Both sexes	5,611	236	33.5	92.2	104.2	62.6	98.5	141.7	168	224	252	286	330	476	558	742	1,010	1,072	1,251	781
Male	2,449	205	27.4	83.4	106.2	61.7	74.0	110.5	123	190	215	254	295	426	529	756	1,171	1,143	1,506	988
Female	3,162	245	39.8	101.2	102.3	63.4	118.6	167.9	209	255	288	318	364	523	583	731	881	1,015	1,074	656
Total recorded cases of any kind:																				
Both sexes	14,850	597	123.9	223.9	241.4	180.0	262.9	348.0	427	564	637	706	887	1,213	1,506	2,097	2,670	3,327	3,706	3,963
Male	6,486	543	99.6	190.3	246.3	162.2	196.4	246.3	317	473	514	623	797	1,133	1,453	2,189	3,095	3,753	4,449	5,096
Female	8,364	647	149.0	257.9	236.6	196.1	317.6	433.2	525	646	757	788	976	1,290	1,553	2,018	2,328	2,987	3,192	3,282

[1] [2] See footnotes [1] and [2] on table 1. For population used see table 3.

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Table 6. *Age and sex incidence and prevalence [1] of cardiovascular-renal cases per 100,000 among 2,500,000 persons in 83 cities and towns in 18 States, 1935–36*

Type of case and onset of disability [2]	All ages		Age																	
	Number cases	Rate	Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85 and over
Total with any disability during year:																				
Both sexes	40,719	1,638	220.0	332.4	405.4	380.7	409.0	486.1	716	1,061	1,445	1,962	2,784	3,990	5,439	7,702	9,644	12,347	13,732	15,209
Male	17,157	1,437	225.3	321.8	392.6	351.9	264.5	299.1	441	786	1,115	1,577	2,282	3,753	5,253	7,686	10,081	12,356	13,940	16,069
Female	23,562	1,823	214.5	343.2	418.1	406.8	528.0	642.8	959	1,312	1,764	2,346	3,287	4,215	5,604	7,716	9,923	12,341	13,588	14,692
Onset [3] within study year and disabled for 7 or more consecutive days:																				
Both sexes	23,972	964	185.8	240.7	241.0	229.5	252.6	301.7	431	593	775	1,133	1,606	2,283	3,125	4,412	5,653	7,450	9,046	10,562
Male	10,233	857	195.4	226.6	241.8	214.4	153.0	190.6	287	468	605	956	1,389	2,231	2,992	4,287	5,782	7,432	9,400	10,972
Female	13,739	1,063	176.0	254.9	240.2	243.2	334.7	394.7	559	706	940	1,309	1,824	2,333	3,243	4,519	5,549	7,464	8,801	10,316
No previous attack (new cases):																				
Both sexes	12,877	518	160.5	170.7	140.8	130.1	147.0	155.5	230	303	380	590	838	1,216	1,606	2,290	3,033	3,962	5,172	6,326
Male	5,919	496	166.8	166.8	143.7	129.9	97.7	115.4	177	254	322	564	812	1,279	1,653	2,418	3,183	4,246	5,430	6,448
Female	6,558	538	154.1	174.6	137.9	130.2	187.7	189.2	276	347	436	616	864	1,157	1,564	2,180	2,912	3,736	4,993	6,252
Onset [3] prior but disabled during year:																				
Disabled 7 or more consecutive days:																				
Both sexes	8,329	335	25.3	41.4	58.8	64.8	55.7	58.8	84	154	249	314	492	861	1,244	1,932	2,618	3,298	3,333	3,709
Male	4,562	382	26.1	49.1	54.4	66.4	60.2	52.8	67	147	270	347	551	1,072	1,591	2,506	3,336	3,902	3,559	4,108
Female	3,767	291	24.4	33.7	63.2	63.4	52.0	63.9	100	160	230	280	434	661	937	1,440	2,040	2,816	3,176	3,470
Intermittent disabilities of less than 7 consecutive days:																				
Both sexes	8,418	339	8.8	50.3	105.6	86.4	100.7	125.7	200	315	420	515	685	845	1,070	1,358	1,373	1,600	1,354	937
Male	2,362	198	3.7	46.1	96.4	71.1	51.3	55.7	88	171	241	274	343	451	670	893	962	1,022	981	988
Female	6,056	468	14.1	54.6	114.8	100.2	141.4	184.2	300	445	594	757	1,029	1,221	1,424	1,756	1,704	2,060	1,612	907
Nondisabling residuals of previous cases:																				
With restriction of activity during year:																				
Both sexes	10,344	416	14.5	56.2	105.6	131.9	110.5	160.0	230	344	446	577	741	1,045	1,392	1,791	2,170	2,362	2,091	1,464
Male	3,499	293	12.4	54.0	104.4	131.8	86.8	108.5	124	205	320	347	442	662	1,033	1,451	1,709	1,877	2,031	1,560
Female	6,845	530	16.7	58.5	106.8	131.9	130.0	203.1	325	470	568	806	1,040	1,410	1,709	2,081	2,540	2,750	2,133	1,407
Without restriction of activity during year:																				
Both sexes	42,670	1,716	92.3	295.5	381.3	472.5	642.1	833.7	1,078	1,450	1,906	2,499	3,196	4,363	5,426	6,670	7,766	8,468	7,627	5,916
Male	14,454	1,211	95.8	300.2	377.4	391.7	492.4	591.4	730	1,026	1,298	1,585	1,993	2,915	3,852	4,702	6,030	7,088	6,822	5,616
Female	28,216	2,183	88.6	290.6	385.2	545.5	765.3	1,036.6	1,387	1,835	2,495	3,411	4,404	5,741	6,819	8,353	9,165	9,569	8,185	6,096
Total recorded cases of any kind:																				
Both sexes	93,733	3,769	326.8	684.1	892.3	985.1	1,161.6	1,479.8	2,024	2,856	3,797	5,038	6,721	9,397	12,257	16,162	19,580	23,178	23,450	22,589
Male	35,110	2,941	333.5	676.0	874.4	875.4	843.7	999.1	1,295	2,017	2,734	3,509	4,717	7,329	10,138	13,839	17,820	21,321	22,793	23,245
Female	58,623	4,535	319.8	692.4	910.0	1,084.2	1,423.3	1,882.5	2,671	3,617	4,827	6,563	8,732	11,366	14,132	18,150	20,997	24,659	23,906	22,194

[1] [2] See footnotes [1] and [2] on table 1. For population used see table 3.

Figure 4 shows a variety of rates for each of the four groups of diseases. Referring first to heart disease, the rate for the total recorded cases levels off above 75 years and the rate for nondisabling cases decreases after that age. This drop in nondisabling cases at the oldest ages is true for those with as well as without restriction of physical activity. The same drop is seen for cases with intermittent disabilities of less than 7 consecutive days. Presumably these decreases are a reflection of the gradual increase with age in the severity of the cases, the nondisabled becoming disabled as they reach these advanced ages. On the other hand, the total disabling cases and even the new disabling cases continue to rise to a maximum for persons over 85 years of age.

Hypertension rates show much the same tendencies as heart disease with respect to the advanced ages; the nondisabling with and without restriction of activity and the cases with intermittent disabilities of less than 7 days all decrease at about 75 years, but the disabling cases increase to a maximum at 85 years and over. As already noted, hypertension rates show the greatest variation with age; the types of rates that account for this large variability are mainly the nondisabling cases.

With respect to nephritis, there is less difference between the age variation of the different types of rates. For nearly all degrees of severity the relative age curves are about the same, plotting roughly as straight lines on the semi-logarithmic grid. However, there is some tendency for the milder cases to decrease in the ages above 80 years. In nephritis, intermittent disability and restricted activity without complete disability are relatively less frequent than in heart disease and hypertension.

The cardiovascular-renal diseases are a composite of the three diagnoses and show largely the same picture as heart disease with rates for the nondisabling, those with restricted activity only, and those with intermittent disability turning down definitely after 75 years, and with a slight decline in those ages in the total recorded cases. As in the case of both hypertension and heart disease the rates for cases with restricted activity and intermittent disability are quite low in the younger ages.

Figure 4 also shows death rates from each of the three diagnoses and for the group of cardiovascular-renal diseases. These rates are based on deaths occurring during this study year as recorded in the family survey. They include all deaths in which the given diagnosis was a factor in the case, whether or not it was the primary cause. However, in the cardiovascular-renal total, cases or deaths are counted only once, even though heart, hypertension, and nephritis were all involved in the case. The causes of death reported by the family were corrected from death certificates which were obtained from State agencies for the great majority of the deaths.

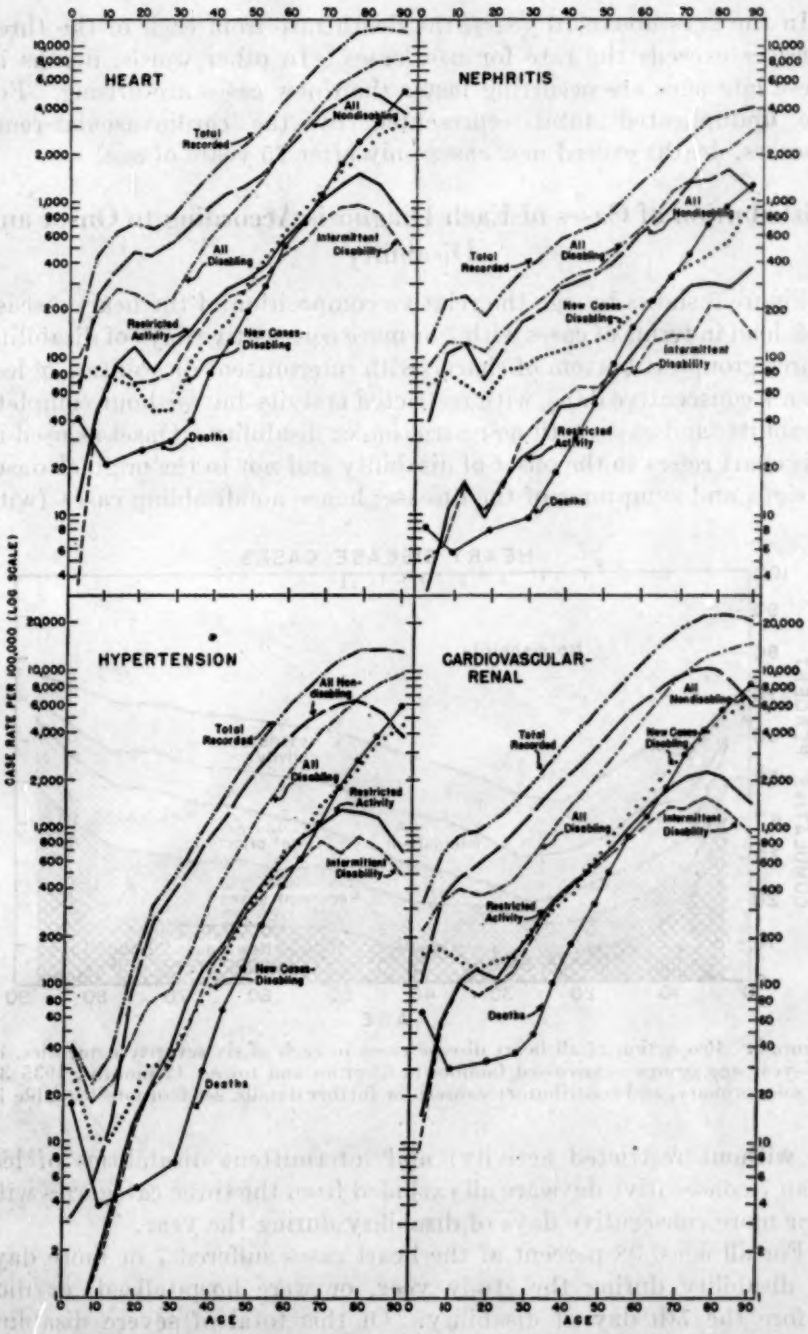

Figure 4. Age prevalence of cases of various severity categories and age incidence of new cases disabling for 7 consecutive days or longer for all cardiovascular-renal diseases and for each of the three diagnoses—canvassed families in 83 cities and towns, 12 months, 1935–36 (sole, primary, and contributory causes; for details about inclusions in each category, see footnotes to table 1).

In the ages above 70 years, the death rate from each of the three diseases exceeds the rate for new cases. In other words, deaths in these late ages are occurring faster than new cases are arising. For the unduplicated total represented by the cardiovascular-renal diseases, deaths exceed new cases only after 75 years of age.

Distribution of Cases of Each Diagnosis According to Onset and Disability

Figure 5 shows by age the relative composition of the heart disease case load in terms of cases with 7 or more consecutive days of disability (three groups at bottom of chart), with intermittent disabilities of less than 7 consecutive days, with restricted activity but without complete disability, and cases with no restriction or disability. Onset as used in this chart refers to the onset of disability and not to the original onset of signs and symptoms of the disease; hence nondisabling cases (with

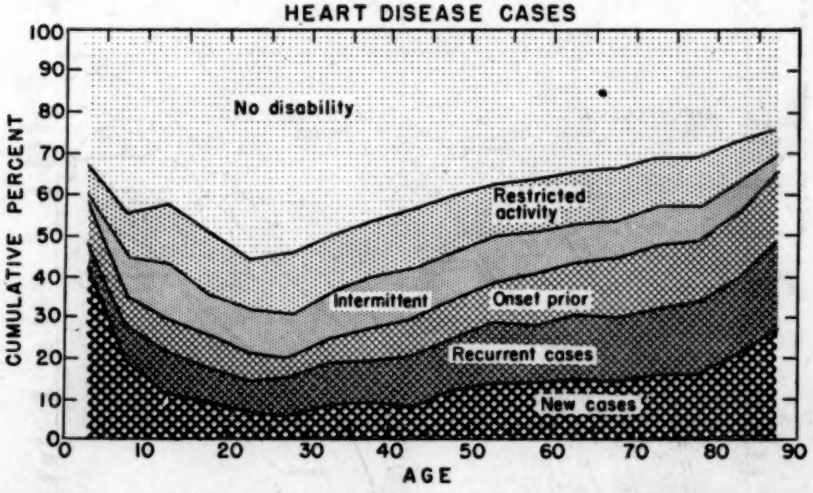

Figure 5. Proportion of all heart disease cases in each of six severity categories, by 5-year age groups—canvassed families in 83 cities and towns, 12 months, 1935–36, (sole, primary, and contributory causes; for further details, see footnotes to table 1).

or without restricted activity) and intermittent disabilities of less than 7 consecutive days are all excluded from the three categories with 7 or more consecutive days of disability during the year.

For all ages, 38 percent of the heart cases suffered 7 or more days of disability during the study year, or were hospitalized, or died before the 7th day of disability. Of this total of severe disabling cases during the year, 35 percent represented the first attack ever experienced, and 36 percent were patients who had suffered at least one attack previous to the study year. The remaining 29 percent

were disabled at the beginning of the year and remained so for 7 consecutive days or longer (average 295 days within the year per case).

In terms of proportions of cases, there is much variability with age in the heart disease case load (fig. 5). For the age group under 5 years, 58 percent of the cases were disabling for 7 consecutive days or longer including hospital cases and deaths (three bottom categories on chart). This high proportion is due in part to the inclusion of congenital heart cases which have a high fatality rate. From this peak of 58 percent, the 7-day disabling cases decreased to 20 percent at 25–29 years with a gradual increase thereafter to 66 percent at ages 85 years and over. Conversely, cases with no disability and no restriction, with restricted activity but no disability, and with only intermittent disabilities of less than 7 consecutive days, comprise 80 percent at 25–29 years. Patients with no disability and no restriction of activity comprise 55 percent of the cases at 25–29 years and 56 percent at 20–24 years.

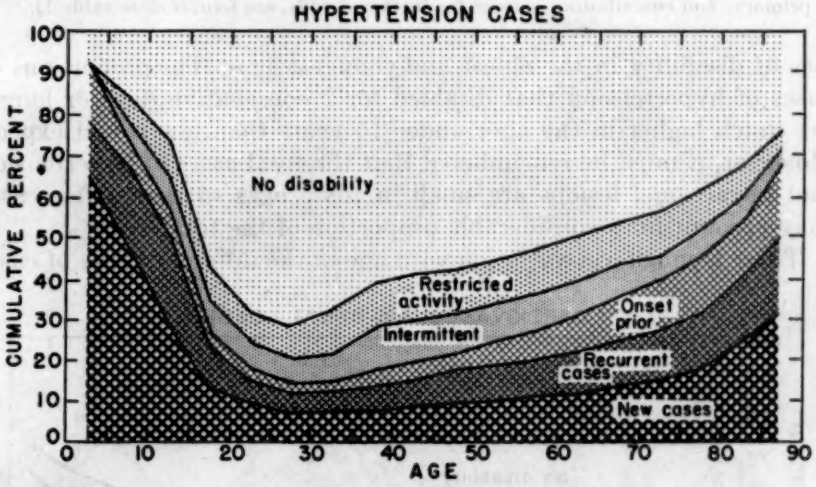

Figure 6. Proportion of all hypertension cases in each of six severity categories, by 5-year age groups—canvassed families in 83 cities and towns, 12 months, 1935–36 (sole, primary, and contributory causes; for further details, see footnotes to table 1).

Figures 6, 7, and 8 show similar data for hypertension, nephritis, and the total of cardiovascular-renal diseases. It may be noted that a very high proportion of the hypertension cases (fig. 6) have no disability, the largest percentage occurring at 25–29 years, with 72 percent having no disability and no restriction of activity, and 86 percent having either no disability, restriction of activity only, or intermittent disabilities of less than 7 consecutive days. From this low point of 14 percent for disabling hypertension cases of 7 consecutive days or longer, the disabling curves rise to high relative frequen-

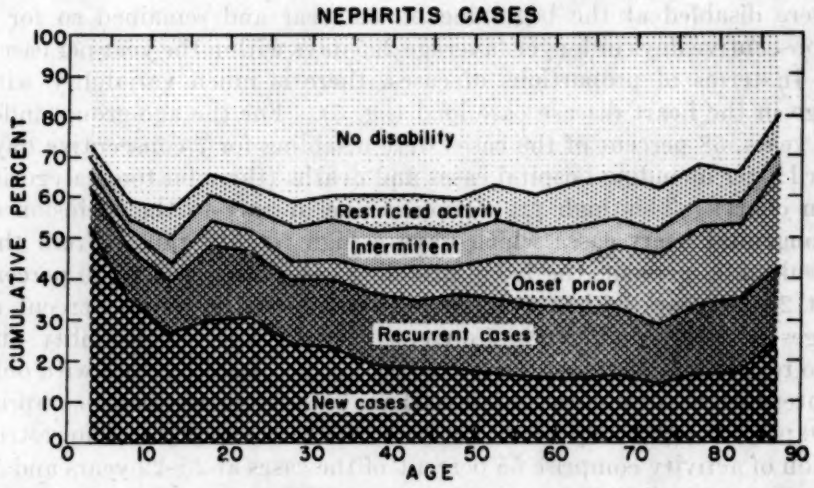

Figure 7. Proportion of all nephritis cases in each of six severity categories, by 5-year age groups—canvassed families in 83 cities and towns, 12 months, 1935–36 (sole, primary, and contributory causes; for further details, see footnotes to table 1).

cies of disability in the oldest and youngest ages. The proportions of cases of hypertension that disabled for 7 consecutive days or longer are much higher in the ages under 15 years than one would expect. However, it must be remembered that the total cases of hypertension and intracranial lesions are small in these ages so that a few cases may account for a considerable proportion of the total.

There is much less variation with age in the different types of cases

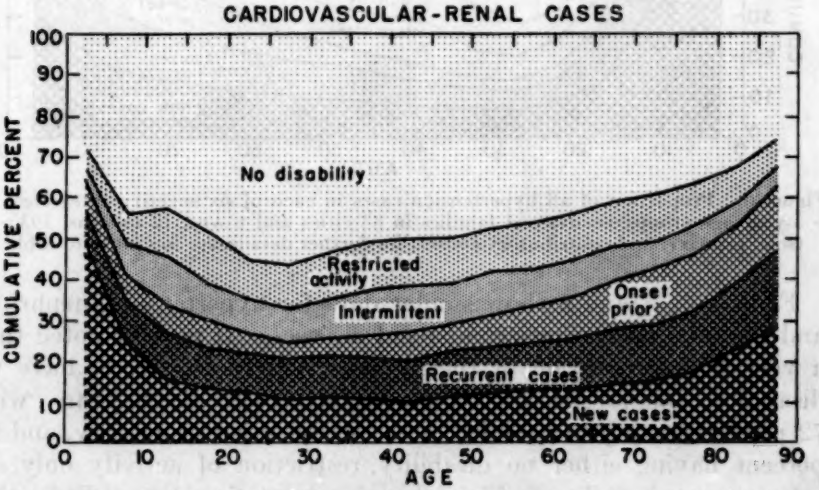

Figure 8. Proportion of all cardiovascular-renal diseases in each of six severity categories, by 5-year age groups—canvassed families in 83 cities and towns, 12 months, 1935–36 (unduplicated total of the three separate diagnoses; for further details, see footnotes to table 1).

of nephritis than in the other diseases. For example, the cases with no disability and no restriction of activity in the ages 5 to 85 vary only from 43 to 32 percent of the total nephritis cases (fig. 7). The age groups under 5, and 85 and over have slightly lower percentages of cases that are without disability. The largest variation with age occurs in the new cases with 7 or more consecutive days of disability.

Figure 8 shows a similar distribution for the combined cardiovascular-renal diseases, with duplicate cases eliminated. This chart depicts an average of the other three diseases. The general picture is more similar to heart disease than to hypertension or nephritis.

Sex Differences in Rates at Specific Ages

Data thus far presented have pertained entirely to both sexes combined. However, the trend of mortality from heart and related diseases has been considerably different for men and women and comparisons of morbidity rates for males and females are of interest. It may be recalled that heart disease mortality is consistently higher for men than women—a situation which is true of the great majority of the causes of death but not of the causes of illness.

Illness Rates Among Males and Females

Figure 9 shows illness rates for males and females of specific ages for three of the seven categories that were shown for both sexes in figure 4, namely, new cases disabling for 7 consecutive days or longer, all disabling cases, and the total recorded cases including nondisabling.

Referring first to heart disease, the total recorded cases are higher for females from 15 to 70 years of age; the relative difference decreases as age increases until above 70 years of age there is little or no difference. For all disabling cases, including those with intermittent disabilities of less than 7 consecutive days, the rate for females is higher from 20 to 55 years with slightly higher rates for males above 55 years. In the new cases with 7 or more consecutive days of disability, females are above males from 20 to 45 years, with higher rates for males above that age and with relative differences between the sexes increasing as age increases. In terms of fatal termination, these new 7-day disabling cases are the most severe (table 7). Thus as the severity of the case increases, the excess of the rates for males over females tends to be larger and to involve more of the adult age groups.

Hypertension rates are rather predominantly higher for women than men. Considering the total recorded cases and also all disabling cases, the rates for females are higher than those for males at all of the ages above 10 years. With respect to new cases disabling for 7 consecutive days or longer, the rates for females are higher than those for

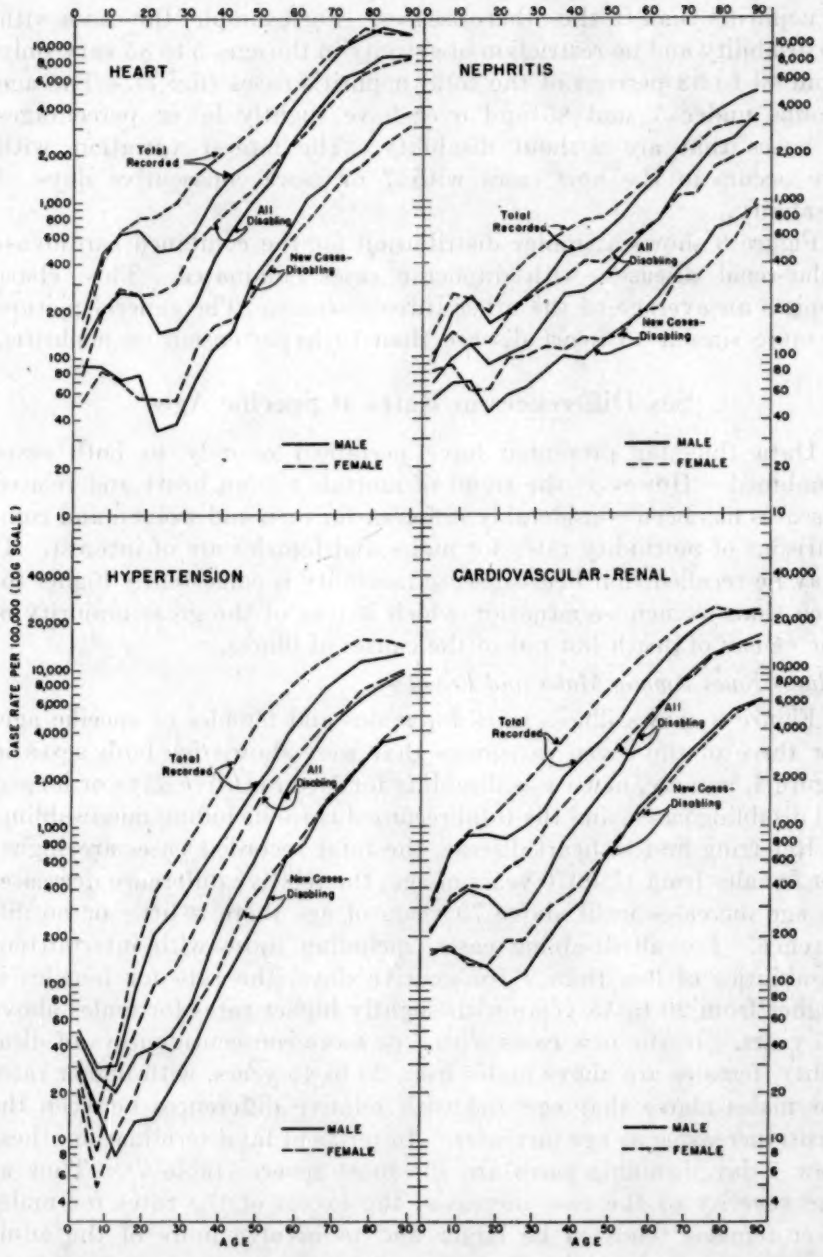

Figure 9. Age prevalence among males and females of all recorded cases and of all disabling cases, and age incidence of new cases disabling for 7 consecutive days or longer for cardiovascular-renal diseases and for each of the three diagnoses—canvassed families in 83 cities and towns, 12 months, 1935–36 (sole, primary, and contributory causes; for further details, see footnotes to table 1).

males from 10 to 55 years with negligible differences above that age.

The rates for nephritis for females are higher in the ages from 15 to 65 years for all recorded cases and for all disabling cases, and from 15 to 50 years for new cases disabling for 7 consecutive days or longer. Above those ages the rates for males are rather consistently higher than corresponding rates for females.

Death rates in the entire United States from these diseases, particularly from heart disease, are generally higher for males than females. In this survey the informants were usually women and they would be able to report more completely upon their own illnesses, particularly of the nondisabling type, and this type makes up a considerable part of the total recorded cases. As already noted, disabling illness from each of these cardiovascular-renal diseases usually involves a rather long duration of disability, and considerable time in bed. Therefore, for the cases disabling for 7 or more consecutive days, particularly those with onset of disability during the study year, the reporting error might be expected to be reasonably small. With respect to many other diseases, it has been noted that the incidence and prevalence of cases is generally higher for women than men, in spite of higher death rates for men (*6*). Thus, it cannot be assumed that the large sex differences in the rates are all due to incompleteness of reporting. Some of the difference may be accounted for by lack of knowledge of the informant as to the existence of the disease in the husband and other adults in the family. Moreover, women are generally in contact with physicians more than men, particularly during the childbearing ages, and it is possible that some of the excess in known cases, particularly of the minor type, is due to these more frequent visits to physicians which may lead to the discovery of more heart cases among women.

Death Rates Among Males and Females

Mortality recorded in the survey was much lower than registered in the United States—a difference which cannot be attributed to the absence of rural areas in the survey. In single-visit surveys of this type, deaths are always understated not so much because of forgetfulness as because death tends to break up families, leaving no residual of the family to report the death to the enumerator. Even if the widow is living with her father's family at the time of the survey, the death of her husband is missed because it did not occur in the family for which reports are being recorded (*12*).

Before considering sex differences, it may be well to consider the form of these mortality curves as plotted for 1945–46 on a semilogarithmic grid (fig. 10). From the ages of 30 to 80 years the mortality curves for females for nephritis, for heart disease, and for the cardio-

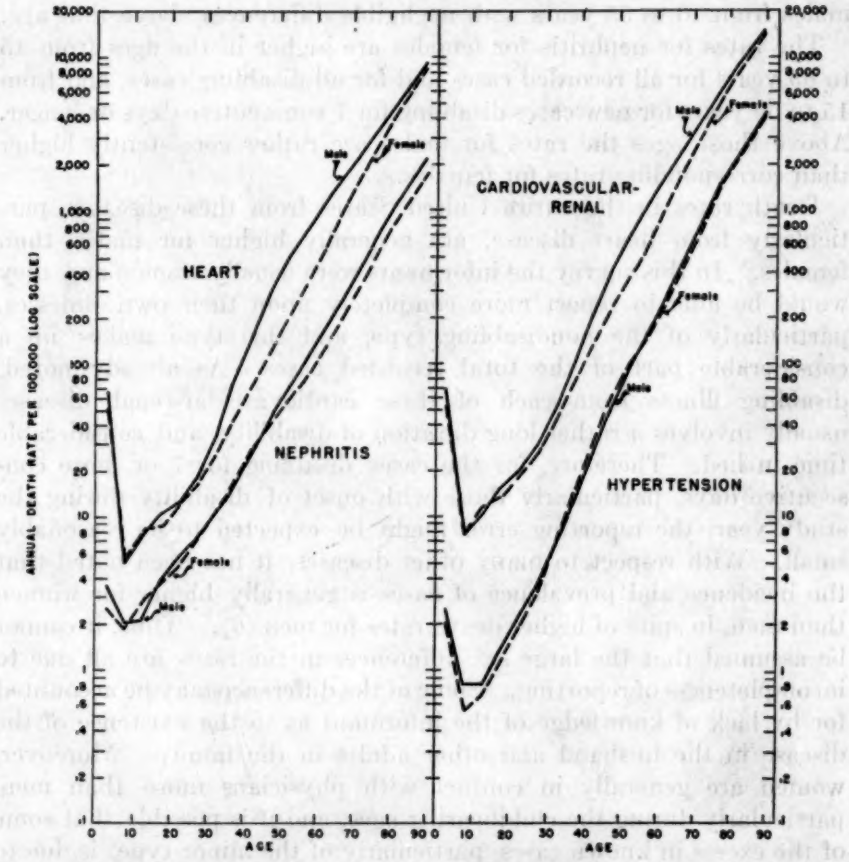

Figure 10. Annual age-specific mortality rates among males and females from all cardiovascular-renal diseases and from each of the three diagnoses—registered deaths in the continental United States, 2 years, 1945 and 1946 (sole or primary causes).

vascular-renal total tend to plot as a straight line. Such a straight line on a semi-logarithmic chart indicates that throughout this long age range the death rate increases at a constant percentage. For example, the percentage increase in the rate from 30 to 35 years is approximately the same as from 75 to 80 years. The curves for males for heart disease and for the total cardiovascular-renal group bow gradually upward in the middle ages. This means that the percentage increase with age in these death rates is somewhat higher in the younger than in the older ages of life. The mortality curves for hypertension are fairly straight but there is a slight upward bow in the middle ages for both males and females.

Death rates (sole and primary causes) from heart disease (including or excluding congenital) in the United States in 1936 showed no consistent sex differences in the ages under 30 years. After 30 years, the rates separate with those for males remaining consistently above

those for females to the end of the life span. By 1945–46 (fig. 10) the heart disease death rates were consistently higher for males of the several age groups above 15 years and the relative differences between the sexes were larger than at the time of this survey in 1935–36. The maximum relative differences between heart disease death rates for males and females occurred at 50–54 years with the 45–49 and 55–59 age groups close seconds. Above and below these ages the relative differences gradually decreased. Presumably industrial work is an important factor in these sex differences. It will be remembered that the more severe types of heart and other cardiovascular-renal diseases tended also to show higher rates for males in the older ages.[8]

Death rates from hypertension in 1945–46 were slightly but consistently higher for males under 30 years, very slightly lower for males from 30 to 55 years, and slightly higher for males over 55 years (fig. 10). Although the relative differences were consistent within the age periods mentioned they were so small as to be of little significance. The situation in the United States in 1936 was approximately the same.

Nephritis mortality among males and females under 45 years showed no consistent differences between the sexes. Above 45 years the mortality was higher for males, the relative differences being about the same throughout the remaining years of life (fig. 10).

Mortality rates, based on deaths recorded in the survey, show somewhat more consistent excesses for males than is true of rates based on registered deaths in the entire United States in either 1935–36 or 1945–46. As already noted, there are biases in mortality rates recorded in single-visit surveys due to the fact that sometimes there is no residual of the household to report the death (*12*). With respect to sex differences women live longer, on the average, than men and probably a higher percentage of widows than widowers maintain a home after the death of the spouse. Thus there is a greater probability of the house-to-house canvasser obtaining from the widow a record of the death of her husband than of obtaining from the widower a record of the death of his wife.

In view of the rather consistently higher survey case rates for the cardiovascular-renal diseases among females, with the reverse for death rates, some reports on medical examinations may be reviewed. In examinations of men and women by the Life Extension Institute (*1*), findings in terms of rates for organic heart diseases, enlarged heart, and functional murmurs and irregularities were all higher for females than males for ages 20–59, and also for each of the subgroups, 20–44

[8] Populations used included persons overseas, in spite of the exclusions of deaths overseas. Records indicate that very few deaths from chronic diseases occurred among the military forces overseas because of the policy of transferring by airplane such cases to hospitals within the continental United States as soon as possible. Thus the great majority of the deaths from chronic diseases occurred in the United States even for cases which originated in the overseas population.

and 45–59. In terms of simple averages of rates in 5-year age groups for the ages 20–59 years, the rate for organic heart lesions was 2.9 percent for men and 5.3 for women; enlarged heart, 2.6 for men and 3.2 for women. Arterial thickening was the only cardiovascular-renal condition which did not show an excess in the rate for women over men, the rates being 13.8 for men and 12.4 for women. On the other hand, examinations in 1940 of farm families receiving loans from the Farm Security Administration showed higher heart disease rates for men than women but blood pressures of 150 or above, systolic, or 90 or above, diastolic, or both, showed higher rates for women of comparable ages, as follows: 15–44 years, men 5.9 percent, women 7.4; 45 and over, men 32.6, women 46.1 percent (*13*).

In the New York study of hospital discharges (*7*, *19*), rates for hospital cases of heart disease were approximately the same for males and females; hypertension rates were lower and nephritis rates higher for females than males. The diagnosis groups were roughly comparable with those used in the present study.

Case Fatality

Detailed data are not available for computing what might be termed correct case fatality rates. However, ratios of deaths recorded in the survey to prevalent recorded cases will give some indication of fatality.

Ratio of Deaths During Year to Prevalent Cases

Table 7 shows these ratios in terms of deaths from the given disease as a percentage of the total recorded cases. Of all recorded heart cases, 11 percent were fatal during the study year. The corresponding percentages by sex were 16 for males and 8 for females. The highest fatality ratios for heart disease occurred at 65 years and over—24 percent for males and 15 percent for females. For hypertension, the fatality percentages were also uniformly higher for males than females at each of the broad age groups. For all ages and for the ages 65 years and older, the fatality ratios were roughly the same as those for heart disease, but for the two age groups from 20 to 64 years, hypertension fatality was definitely less than for heart disease. For all ages combined, nephritis showed approximately the same fatality ratio as heart disease, but for age groups under 45 years the ratios were consistently less than those for heart disease.

Relating the deaths from each disease to all cases with disability of 7 consecutive days or longer (including hospital cases and deaths before the 7th day), 30 percent of such heart cases ended fatally within the study year, 32 percent of hypertension cases, and 21 percent of nephritis cases. The figures for males are rather uniformly higher than those for females, reaching, for heart disease, 42 percent in the

Table 7. *Case fatality—ratio of deaths during study year to various types of cases—canvassed families in 83 cities and towns in 18 States, 1935–36*

Diagnosis and sex	All ages	Age				All ages	Age			
		Under 20	20–44	45–64	65 and over		Under 20	20–44	45–64	65 and over
	Percent of cases disabling for 7 or more days [1] that were fatal					Percent of all cases that were fatal				
Heart disease:										
Both sexes	29.5	17.0	19.2	27.2	38.9	11.1	5.2	4.9	10.7	18.8
Male	34.8	19.2	28.3	33.3	41.9	16.0	6.3	8.4	16.8	23.8
Female	24.3	14.7	13.3	20.3	36.0	7.7	4.2	3.1	6.5	15.1
Hypertension:										
Both sexes	32.0	25.6	15.8	25.6	41.3	9.7	11.7	2.8	6.8	17.2
Male	38.3	27.4	24.1	33.5	45.1	15.2	15.5	4.7	12.1	23.3
Female	27.3	23.5	11.6	19.8	38.3	7.1	8.8	1.9	4.4	13.8
Nephritis:										
Both sexes	21.1	7.3	7.1	25.3	37.5	9.8	3.8	3.2	11.2	18.7
Male	25.5	9.9	10.1	29.2	39.1	12.3	5.0	4.5	14.0	20.4
Female	17.5	5.3	5.4	21.6	35.7	7.9	2.8	2.4	8.9	17.1
Cardiovascular-renal: [4]										
Both sexes	25.3	13.7	13.2	23.4	35.6	8.7	5.0	3.4	7.6	15.6
Male	30.6	16.6	20.1	29.5	38.4	12.9	6.3	5.9	12.5	20.0
Female	20.9	11.0	9.1	17.7	33.0	6.2	3.9	2.2	4.7	12.7
	Percent of new cases [2] that were fatal					Number of deaths among new cases [3]				
Heart disease:										
Both sexes	38.2	21.9	26.0	35.9	49.9	2,380	130	256	853	1,138
Male	45.4	22.2	42.2	43.8	54.9	1,426	72	165	566	623
Female	30.8	21.6	15.4	26.5	45.0	954	58	91	287	515
Hypertension:										
Both sexes	36.5	28.1	16.2	32.2	45.8	2,151	34	110	753	1,252
Male	42.9	31.3	25.9	39.6	50.0	1,070	20	63	398	589
Female	31.9	24.6	10.8	26.6	42.6	1,081	14	47	355	663
Nephritis:										
Both sexes	17.8	5.1	4.4	24.1	42.3	524	27	44	191	262
Male	21.9	7.7	7.2	27.8	43.7	292	18	28	111	135
Female	14.4	3.1	2.6	20.3	40.8	232	9	16	80	127
Cardiovascular-renal: [4]										
Both sexes	29.6	15.1	14.2	29.4	42.4	3,817	182	353	1,377	1,902
Male	36.3	17.8	23.1	36.8	47.0	2,148	107	216	845	980
Female	24.0	12.4	8.8	22.3	38.4	1,669	75	137	532	922

[1] Cases designated as disabling for 7 consecutive days or longer include those disabled on the day of the visit, deaths before the 7th day, and hospital cases disabled for less than 7 consecutive days.

[2] New cases include only those of the type described in note 1 which had their onset of disability within the study year and no history of previous attack.

[3] Table 8 shows total deaths from the given cause.

[4] It should be noted that cases and deaths for 2 or more of the 3 diagnoses are counted in each diagnosis category involved, but the cardiovascular-renal group represents an unduplicated total of sole or primary causes within this group. Thus the cardiovascular-renal fatality ratio may lie outside of the limits of ratios for the 3 separate diagnoses.

ages over 65 years as compared with 36 percent for females. The fatality ratios for the four diseases are of the same order of magnitude in the age group over 65 years.

Of the 6,237 new heart cases with disability of 7 consecutive days or longer for patients who never had a previous attack, 38 percent were fatal within the study year as compared with 37 percent for hypertension, 18 percent for nephritis, and 30 percent for all cardiovascular-renal cases. Of the new heart cases 65 years old and over, 50 percent were fatal within the year, with ratios of 46 and 42 percent for hypertension and nephritis, respectively. For all ages and for each of the

four broad age groups for each disease, these fatality ratios are uniformly higher for males than females (table 7).[9]

Higher fatality ratios for males may result from less complete reports of cases among men because women are usually the informants and know their own ailments best. However, this situation would affect mainly the minor nondisabling cases rather than those disabling for 7 consecutive days or longer. The deaths used in computing the fatality ratios given in table 7 and discussed above were those recorded in the survey. In these death data the bias is toward more complete records for men, for reasons discussed in a preceding paragraph. However, studies of absences from work on account of illness from all causes indicate that women suffer more frequent illness than men (*4, 8, 10, 11*) even though their death rates are lower (*6*). Sex differences in illness may be exaggerated in this study, but it is believed that there are real differences, with higher case rates for females.

Hospitalized illness rates for New York City, based on a study of discharges from hospitals (*7*) during 1933, were far above rates for hospitalized cases in this surveyed group which covered many smaller cities and towns. The New York hospital case rates for heart diseases, hypertension, and the whole cardiovascular-renal group were equal to approximately 90 percent of the survey rates for cases disabled for 7 consecutive days or longer and with onset of disability within the study year; the corresponding figure for nephritis was 75 percent. Since these hospital rates are large, case fatalities in the New York study are of interest. In that study 29 percent of the hospitalized cardiac cases were fatal as compared with 30 percent fatal for all survey cases disabling for 7 consecutive days or longer, 33 percent for all such cases with onset of disability within the study year, and 38 percent for such new disabling cases. Case fatalities for the other diagnoses were: hypertension, 30 percent for New York cases, 32 percent for all survey 7-day or longer disabling cases, 32 percent for all such cases with onset of disability within the year, and 37 percent for such new disabling cases; nephritis, 23 percent for New York cases, 21 percent for all survey 7-day or longer disabling cases, 19 percent for all such cases with onset of disability within the year, and 18 percent for such new disabling cases. Thus, hospital case rates in New York City were of the same order of magnitude as survey cases with onset of disability within the study year and with

[9] The exclusion of the nondisabling new cases (original onset of symptoms within the study year) from the count of new 7-day or longer disabling cases obviously increases the computed case fatality because all deaths before the 7th day were counted with the 7-day or longer disabling cases. Case fatalities for all new cases (including nondisabling new cases) for all ages and both sexes may be compared with those for new 7-day or longer disabling cases in table 7, as follows: heart disease, 32 percent died within the study year; hypertension, 28 percent; nephritis, 16 percent; and total cardiovascular-renal diseases, 24 percent. See footnote 4 and table on p. 1449 for other data relating to nondisabling new cases. While the fatalities for new cases computed in this way are considerably lower than those for new 7-day or longer disabling cases in table 7, they are still roughly comparable to those for hospital cases in New York City (7).

7 or more consecutive days of disability, and the cases experienced roughly the same fatality as in this study.

Proportion of Deaths Occurring Suddenly

Deaths in this survey were recorded as cases with fatal terminations. Therefore, data are available on each death as to the days of disability which preceded death. The records indicated that a high percentage of the heart deaths occurred immediately (without disability) or with only one day of disability. Presumably the count of these cases can be interpreted as the number that died from a heart attack either immediately or within approximately 24 hours. Table 8 shows in broad age groups what percent of the deaths were immediate (died without disability) and what percent died within approximately 24 hours, including those who died immediately. The upper half of the table shows these figures for new cases—that is, those with onset of disability within the study year and with no previous attack. In this group 17 percent of the heart deaths of all ages were immediate and 31 percent were immediate or within approximately 24 hours. At the peak age group, 45–64 years, the figures were 24 percent without disability and 39 percent died within 24 hours. A consistently higher percentage of the male than the female deaths occurred suddenly; for all ages, 22 percent of the deaths of males were without disability as compared with 11 percent for females. Corresponding proportions of deaths that occurred within 24 hours of the attack were 37 percent for males and 23 for females. In the age group 45–64, 28 percent of the deaths of males and 14 percent of those of females were immediate, and 44 percent of those of males and 30 percent of those of females were within 24 hours of the onset of the disabling heart attack.

Sudden deaths from hypertension were less frequent and were almost negligible for nephritis.

The lower half of table 8 shows similar percentages based on all deaths that occurred within the study year rather than deaths of new cases only. However, deaths with onset of the fatal disabling case prior to the study year are never counted as sudden deaths. As might be expected, sudden deaths constitute a smaller proportion of all deaths than they do of deaths from new cases.

Since the percentages of heart deaths that occurred suddenly varied so definitely with age, the figures were computed for more detailed age groups for heart disease and hypertension. Figure 11 shows these data graphically. It is seen that the percentages of all heart deaths that occurred suddenly are uniformly less for females than males. The peak for both of the sexes occurs at 45–54 years, with 33 percent of deaths of males within approximately 24 hours of the onset of the disabling attack as compared with 22 percent for females.

Table 8. *Percentage of deaths from the different diagnoses in the group of cardiovascular-renal diseases occurring suddenly or within 24 hours of onset of disability—canvassed families in 83 cities and towns in 18 States, 1935–36*

Age and sex	Percent of deaths occurring suddenly (no disability)				Percent of deaths within 24 hours [1] of onset of disability				Number of deaths during study year			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
Deaths Among New Cases [2]												
All ages:												
Both sexes	17.4	9.5	2.5	14.1	31.3	23.2	8.2	28.3	2,380	2,151	524	3,817
Male	21.9	11.9	1.7	18.0	36.6	27.5	7.2	33.5	1,426	1,070	262	2,148
Female	10.7	7.2	3.4	9.0	23.3	19.0	9.5	21.6	954	1,081	232	1,669
Under 20 years												
Both sexes	3.1	2.9	------	2.7	16.2	32.4	------	17.6	130	34	27	182
Male	1.4	5.0	------	1.9	19.4	40.0	------	20.6	72	20	18	107
Female	5.2	------	------	4.0	12.1	21.4	------	13.3	58	14	9	75
20–44:												
Both sexes	20.7	16.4	4.5	18.1	34.8	25.5	4.5	30.6	256	110	44	353
Male	23.6	20.6	7.1	21.3	41.2	27.0	7.1	36.1	165	63	28	216
Female	15.4	10.6	------	13.1	23.1	23.4	------	21.9	91	47	16	137
45–64:												
Both sexes	23.6	11.3	2.6	18.6	39.5	32.1	11.5	37.3	853	753	191	1,377
Male	28.4	14.3	1.8	22.2	44.3	37.2	9.9	42.4	566	398	111	845
Female	13.9	7.9	3.8	11.3	30.0	26.5	13.8	29.1	287	355	80	532
65 and over:												
Both sexes	13.8	8.1	2.3	11.1	26.0	17.3	7.3	22.4	1,138	1,252	262	1,902
Male	18.0	9.5	.7	14.5	30.3	20.5	5.9	26.7	623	589	135	980
Female	8.7	6.8	3.9	7.6	20.8	14.5	8.7	17.8	515	663	127	922
All Deaths [3]												
All ages:												
Both sexes	11.6	6.4	2.0	9.4	21.4	15.8	5.9	19.2	5,265	4,523	1,459	8,183
Male	14.8	7.7	1.9	12.0	25.2	17.6	5.9	22.4	3,067	2,294	801	4,524
Female	7.1	5.1	2.1	6.2	16.2	14.0	5.9	15.3	2,198	2,229	658	3,659
Under 20 years:												
Both sexes	3.7	1.9	------	2.9	12.3	25.9	------	13.4	219	54	60	306
Male	3.9	3.2	------	3.3	15.6	32.3	------	16.7	128	31	36	180
Female	3.3	------	------	2.4	7.7	17.4	------	8.7	91	23	24	126
20–44:												
Both sexes	13.0	10.3	2.1	11.5	22.3	18.5	5.5	20.3	593	232	145	793
Male	15.1	11.8	2.6	13.2	27.0	18.5	5.3	23.7	344	119	76	447
Female	10.0	8.8	1.4	9.2	15.7	18.6	5.8	15.9	249	113	69	346
45–64:												
Both sexes	15.2	8.4	2.4	12.7	26.3	22.4	7.6	25.2	1,846	1,458	543	2,822
Male	18.8	9.5	2.3	15.7	30.1	24.1	7.9	28.6	1,192	809	305	1,716
Female	8.7	7.1	2.5	7.9	19.4	20.2	7.1	20.0	654	649	238	1,106
65 and over:												
Both sexes	9.4	5.2	1.8	7.3	18.6	11.9	5.2	15.4	2,600	2,776	710	4,253
Male	12.4	6.4	1.6	9.5	21.6	13.2	4.9	17.7	1,401	1,335	384	2,179
Female	5.9	4.0	2.1	5.0	15.1	10.8	5.5	13.1	1,199	1,441	326	2,074

[1] Within 24 hours includes sudden deaths (no disability) and deaths with only 1 day of disability.
[2] See footnote 2 on table 7.
[3] Based on all deaths that occurred within study year, counting as sudden or 1 day deaths only those with onset of disability within the year which had none or only 1 day of disability.

For children under 5 years the percentage is also high, presumably because of congenital malformations of the heart among the newborn.

Figure 11 shows these data for hypertension also. Hypertension, as will be recalled, includes in this study high blood pressure, arteriosclerosis, and intracranial lesions. The latter are included because they are usually accompanied by hypertension or arteriosclerosis or are an end result of these conditions. It is seen that the peak of sudden deaths occurs in the same age group as it does in heart disease, 45–54 years, but that the peak for under 5 years is even higher than for this middle-aged group.

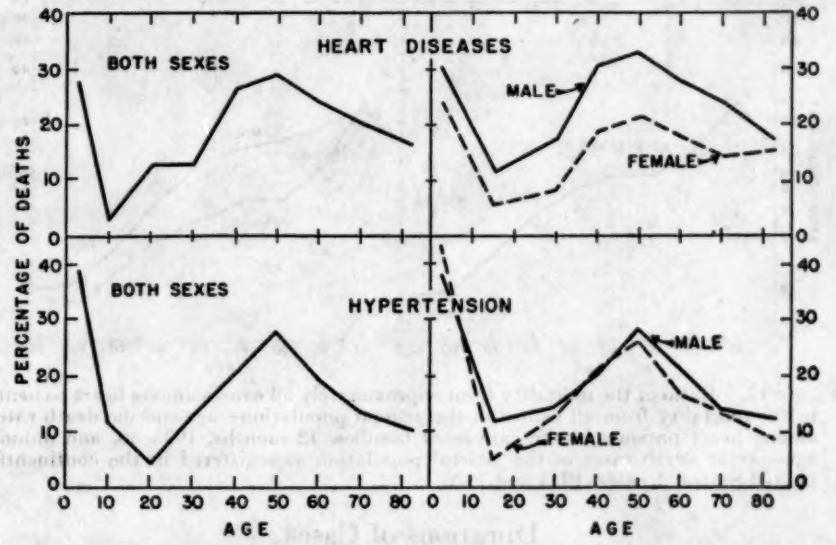

Figure 11. Proportion of heart disease and hypertension deaths from new cases among males and females of specific ages that occurred within approximately 24 hours of the onset of disability—canvassed families in 83 cities and towns, 12 months, 1935–36 (for definition of new cases, see footnotes to table 1).

Death Rates of Heart Patients as Compared With the General Population

In spite of deficiencies in the survey count of deaths, it is of interest to compare death rates of heart patients of various ages with death rates in the general population. Although the survey would probably miss heart diagnoses for patients who were killed in automobile accidents or who died from acute diseases unrelated to heart disease, the fact that the heart group includes all patients with a heart diagnosis as a sole, primary, or contributory cause of illness or death tends to include in the record more deaths among heart patients from acute and unrelated causes than would otherwise be picked up.

Figure 12 shows by age and sex the ratio of the death rate (all causes so far as obtained) among heart patients to the death rate (all causes) in the general population as represented by the annual death rate for the United States for the years of the survey, 1935–36. From a peak ratio at 5–14 years of age indicating that the annual death rate among heart patients of that age group was 26 times that for persons of the same ages in the general population, there is a steady decline until at 75 years and over this ratio is slightly less than 2. Presumably this curve indicates that children of 5–14 years of age with heart disease are a very unrepresentative sample of the population of those ages, with a relatively high risk of mortality. By the age of 75 years there is so much chronic disease and senile weakness in the general population that heart patients are not greatly different from the general run of individuals with respect to the risk of dying.

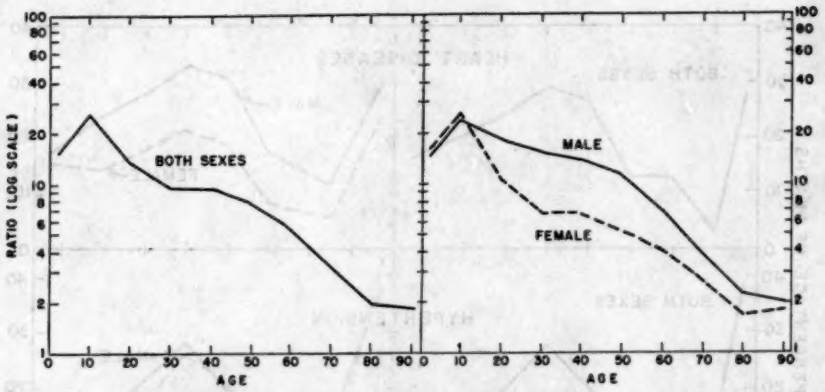

Figure 12. Ratio of the mortality from approximately all causes among heart patients to the mortality from all causes in the general population—age-specific death rates among heart patients in the canvassed families, 12 months, 1935–36, and annual age-specific death rates in the general population as registered in the continental United States, 2 years, 1935 and 1936.

Durations of Cases

The survey recorded durations of various kinds for cases of the different categories. Although the durations (except total duration of the disease) represent time within the study year only, an examination of the means and distributions will be of interest.

Mean Days Disabled per Case

Mean durations shown in table 9 refer to days within the study year only, and are incomplete for cases that existed prior to that year and also for those that were still disabled on the day of the visit. For those with their onset within the study year, the average disability would refer to the days within an average period of approximately 6 months, since these cases would have an average date of onset of roughly the middle of the study year. Considering all cases with disability of 7 days or longer for both sexes of all ages, the mean days of disability for heart disease was 136, with a mean for cases with onset of disability within the year of 70 days, and of 295 days for cases with onset of disability prior to the year. The corresponding means for hypertension were roughly the same as for heart disease, 130 for all cases, 75 for onset of disability within the year, and 283 for onset of disability prior to the year. For nephritis, however, the mean days of disability was somewhat less, and the figures for the total cardiovascular-renal diseases tend to approximate those for heart disease since that diagnosis had the largest number of cases.

With the exception of heart disease with onset within the year, the mean days of disability for cases of all ages was greater for males than females for the various diagnoses and for the different types of cases.

Table 9. *Mean days during the study year per case of the specified diagnosis and type—canvassed families in 83 cities and towns in 18 States, 1935–36*

[Cases disabled for 7 consecutive days or longer[1] during study year]

Type of duration and sex and age of patient	Total cases of given type				Cases with onset within study year				Cases with onset prior to study year				Total cases with 7 or more days of disability[1]			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
													Number of cases[2]			
Cases disabling for 7 or more days:[1]																
All ages:																
Both sexes	135.7	129.5	101.7	125.7	69.7	75.1	56.7	68.7	295.4	282.7	266.7	291.0	17,782	14,137	6,904	32,209
Male	147.1	145.2	114.8	140.0	68.7	79.0	60.4	70.5	299.5	287.2	271.8	296.8	8,770	5,990	3,145	14,748
Female	124.6	117.8	90.6	113.5	70.6	72.6	53.9	67.3	289.8	278.0	260.6	283.8	9,012	8,147	3,759	17,461
Both sexes:																
Under 20	117.9	85.0	58.2	92.9	70.6	61.5	46.9	60.2	267.9	258.6	172.9	252.1	1,215	210	817	2,160
20–44	128.9	109.4	76.0	104.9	67.2	67.3	49.3	59.9	296.9	278.7	257.3	285.4	3,076	1,468	2,044	6,010
45–64	140.2	131.2	106.1	130.3	72.3	77.3	60.7	71.8	305.5	292.8	262.7	300.6	6,792	5,700	2,144	12,045
65 and over	137.5	133.7	142.9	137.2	68.2	75.6	67.9	72.1	289.1	276.3	283.7	288.6	6,681	6,730	1,895	11,951
													Percent in bed			
Cases in bed for 1 or more days:																
All ages:																
Both sexes	51.7	53.3	44.0	49.4	33.7	35.9	29.0	33.0	107.7	114.3	108.8	110.0	84.3	85.9	88.5	85.3
Male	50.4	55.2	47.5	50.1	32.1	35.4	31.1	32.7	99.7	112.2	105.0	103.9	80.0	82.6	85.6	81.4
Female	52.8	51.9	41.3	48.8	35.0	36.3	27.5	33.2	116.4	116.2	113.0	116.0	88.4	88.3	91.0	88.6
Both sexes:																
Under 20	56.5	42.4	32.1	45.4	40.4	31.8	27.4	34.1	122.3	140.2	79.4	113.5	85.8	83.3	91.7	87.6
20–44	48.6	42.8	32.1	40.4	31.6	30.6	24.2	28.0	107.6	103.5	94.8	103.3	86.0	85.8	90.5	87.2
45–64	51.4	50.5	45.8	48.9	34.6	35.1	30.9	33.6	104.3	109.9	105.8	106.6	83.8	84.7	88.7	84.6
65 and over	52.6	58.1	61.0	55.2	32.4	38.0	34.5	35.1	108.9	118.5	120.1	114.5	83.7	86.9	84.9	84.7
													Percent in hospital			
Cases in hospital for 1 or more days:																
All ages:																
Both sexes	33.4	33.6	29.6	32.6	26.0	25.0	23.6	25.3	55.4	64.4	54.6	59.2	20.4	20.5	25.9	20.9
Male	36.9	37.6	33.9	36.6	27.6	25.9	26.4	27.6	60.5	73.4	61.1	64.2	23.3	25.8	28.9	24.3
Female	28.9	29.0	25.1	28.2	24.1	24.1	20.8	22.8	46.6	50.9	45.9	51.7	17.5	16.7	23.3	17.9
Both sexes:																
Under 20	52.9	28.5	33.9	42.2	37.2	24.4	29.6	32.3	103.2	95.8	63.4	92.0	30.0	50.5	30.7	31.9
20–44	31.9	27.4	26.5	28.9	24.1	22.2	20.6	22.2	54.3	50.7	57.5	55.8	27.0	31.1	30.7	28.4
45–64	33.5	33.9	28.5	33.0	27.0	25.3	23.1	25.7	52.1	65.9	50.0	59.1	21.7	22.3	26.0	21.5
65 and over	27.1	36.3	33.0	31.9	21.6	26.0	25.4	24.8	44.1	66.2	51.8	52.7	14.2	15.9	18.4	14.4

[1] Includes cases disabled on the day of the visit, deaths before the 7th day, and hospital cases disabled for less than 7 consecutive days during year.

[2] Includes some cases with unknown duration of disability if it was indicated that they caused loss of at least 7 days; excludes all other cases with unknown number of days of disability. Both these types of cases amounted to less than 1 percent of the 7 plus-day disabling cases for each diagnosis. All means and distributions are based on cases with known days of disability.

With respect to age, the cases under 20 years tend to show the lowest average days of disability; however, the increase in the means with age is less marked for heart disease than for hypertension and nephritis.

Mean Bed Days per Case

Although disability was recorded in detail only for cases with 7 consecutive days or longer, days in bed during the study year for those disabled cases were recorded for one day or longer. As might be expected, the mean days in bed are generally much less than the mean days of disability. The differences between the mean bed days for males and females are small and neither mean is consistently above the other. With respect to age, there is no regular trend in the means; heart disease cases under 20 years of age generally show higher mean days in bed than any other age group, no doubt because the young cases are rheumatic and bed rest is important. In hypertension and nephritis there is generally a fairly definite tendency toward an increase with age in mean days in bed.

Mean Hospital Days per Case

Of the total cases with 7 or more days of disability, 84 to 88 percent in the three disgnoses were in bed for one or more days during the study year (table 9). However, only 20 to 26 percent of the cases with 7 or more days of disability were in a hospital for one or more days during the year. For all hospital cases the average stay was 30 to 34 days in the three diagnosis groups, but in cases with onset of disability prior to the study year the mean days in the hospital per hospital case amounted to 55 to 64 days within the study year. Again in hospital cases of heart disease, the average stay was definitely greater for the ages under 20 years in total, onset within, and onset prior cases. For the other diagnosis groups the variation with age is irregular but there is some tendency toward as high or higher average days per case for patients under 20 years as in older age groups.

Distribution of Cases According to Days Disabled, in Bed, and in Hospital

As already noted, the days of disability recorded in this study pertain only to those within the study year. Therefore, the maximum disability for a given case was 12 months which would pertain to cases that had their onset of disability at the very beginning or at some time prior to the study year and were unable to work or pursue other usual activities at any time during the year.

Table 10 shows in actual numbers the distribution of cases with 7 or more days of disability according to days disabled, days in bed, and days in the hospital during the study year. At the bottom of the table is shown the percentage of the disabled cases that were disabled for 4 months or longer, 6 months or longer, and 12 months

or longer. For heart disease 42 percent of the cases were disabled for 4 months or longer, 34 percent for 6 months or longer, and 22 percent were disabled throughout the study year. For hypertension the figures were roughly the same except there were only 18 percent who were disabled throughout the study year. For nephritis there were fewer cases with long disability, 30 percent with 4 months or longer, 22 percent with 6 months or longer, and 13 percent disabled throughout the year.

Table 10. ***Distribution of cases of the specified diagnosis according to the days of disability, in bed, and in a hospital during the study year—canvassed families in 83 cities and towns in 18 States, 1935–36***

[All cases disabled for seven consecutive days or longer [1] during year]

Duration in days (or months)	Days of disability				Days in bed				Days in hospital			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
Number of cases												
Total [2]	17,726	14,007	6,880	32,033	17,774	14,126	6,901	32,192	17,777	14,136	6,903	32,201
None					2,796	1,997	793	4,726	14,163	11,235	5,121	25,493
Under 7 days	2,054	1,565	367	3,214	2,829	2,151	881	4,855	871	742	404	1,621
7–11	1,335	1,019	765	2,629	2,108	1,814	1,179	4,317	588	501	334	1,140
12–17	1,186	990	716	2,481	1,744	1,553	950	3,657	527	427	256	981
18–24	1,093	875	662	2,290	1,246	969	599	2,372	325	271	201	661
25–44	2,055	1,708	1,150	4,167	2,433	1,900	957	4,340	590	414	285	1,043
45–74	1,640	1,323	721	3,054	1,522	1,211	576	2,667	315	249	146	575
75–99	998	817	448	1,884	922	699	310	1,576	143	99	63	244
4 months	896	742	345	1,641	541	396	159	889	85	52	39	146
5 months	522	457	164	943	304	297	103	545	46	29	14	77
6 months	485	431	174	852	479	367	127	750	37	28	10	57
7–9 months	954	964	291	1,759	394	343	112	680	50	36	16	78
10–11 months	624	618	157	1,110	146	146	45	266	12	20	6	30
12 months	3,884	2,498	920	6,009	310	283	110	552	25	33	8	55
Percent of cases												
4 months or longer	41.5	40.8	29.8	38.4	14.5	15.1	10.7	13.4	7.1	6.8	5.2	6.6
6 months or longer	33.5	32.2	22.4	30.4	8.9	9.4	6.5	8.2	3.4	4.0	2.2	3.3
12 months	21.9	17.8	13.4	18.8	2.1	2.3	1.8	2.0	.7	1.1	.4	.8

[1] Includes cases disabled on the day of the visit, deaths before the 7th day, and hospital cases disabled less than 7 consecutive days.
[2] See footnote [2] to table 9.

The percentage of bed cases for longer periods was much less than those for disability. For heart cases that were in bed for one or more days, 2 percent were in bed throughout the year, as compared to 22 percent who were disabled throughout the year. Comparing cases in bed for 4 months or longer with cases disabled for 4 months or longer, heart disease shows 15 percent for bed cases and 42 percent for disabled; hypertension, 15 and 41 percent, and nephritis, 11 and 30 percent, respectively.

Mean Total Duration in Years.

Table 11 shows the mean total duration of cases since first diagnosed or since the time first definite symptoms were noted. The data are

shown by sex and age at the time of the survey and separately for cases that caused disability of 7 consecutive days or longer during the year and for nondisabling cases including those with intermittent disabilities of less than 7 consecutive days.

The most interesting item about the table is the difference between the mean total duration of the severe 7-day cases and those that had little or no disability during the study year. Considering heart disease, the mean total duration for all cases was 7.4 years, but the corresponding mean total durations for cases with 7 or more disabling days and for nondisabling cases were 4.9 and 9.0 years, respectively, a ratio of nondisabling to disabling of 1.8. The other two diagnoses and the cardiovascular-renal total show similarly large excesses in

Table 11. *Mean duration in years since disease was first diagnosed or since symptoms were first noted—canvassed families in 83 cities and towns in 18 States, 1935–36*

Sex and age of patient at time of survey	All recorded cases [1]				Cases disabling for 7 consecutive days or longer during year [1]				Cases with no disability or with intermittent disabilities of less than 7 consecutive days [1]			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
All ages:												
Both sexes	7.4	5.5	6.4	6.6	4.9	3.8	4.1	4.3	9.0	6.4	8.5	7.8
Male	6.9	5.3	6.4	6.3	4.7	3.8	4.1	4.2	8.8	6.3	8.5	7.9
Female	7.8	5.7	6.5	6.7	5.1	3.8	4.1	4.4	9.1	6.4	8.4	7.7
Both sexes:												
Under 20	4.8	2.9	3.7	4.4	3.1	2.2	1.6	2.5	5.5	3.4	5.8	5.5
20–44	8.3	4.9	5.5	6.7	5.5	3.1	3.3	4.3	9.3	5.3	7.3	7.6
45–64	7.5	5.5	7.2	6.6	4.8	3.7	4.6	4.3	9.3	6.2	9.3	7.7
65 and over	7.3	6.1	7.6	6.9	5.1	4.0	5.4	4.6	9.5	7.5	9.8	8.6

[1] Excludes cases of unknown duration; all means based on cases of known duration.

mean total durations of the nondisabling cases; nondisabling hypertension cases had a total duration 1.7 times that of the disabling cases, nephritis, 2.1, and the cardiovascular-renal group as a whole, 1.8. These data suggest that the survivors of former attacks of heart disease have been able to get along for many years, whereas the cases with much disability during the study year are of shorter total durations including a considerable number of new cases with a high fatality.

The longer average total duration of the nondisabling cases holds true for males and females of all ages and for persons in each of the four broad age groups shown in the table. The mean total durations of hypertension and nephritis increase regularly with age; there is a definite tendency for such an increase in heart and the total cardiovascular-renal diseases, but with less consistency and regularity.

Mean total durations of all recorded cases are generally longer for females than males.

Distribution of Cases According to Total Duration

Table 12 shows the distribution of cases according to time (months and years) since the condition was first noticed. Considering all cases combined (disabling and nondisabling), roughly one-sixth of the heart disease and hypertension cases had arisen within a year, but one-fourth of the nephritis cases had their onset within that time. Considering longer durations, the proportion of cases arising within 5 years was 52 percent for heart, 62 percent for hypertension, and 59 percent for nephritis. On the other hand, 27 percent of the heart cases had lasted 10 years or longer, 17 percent of hypertension, and 23 percent of nephritis.

Table 12. *Distribution of cases according to duration in years since disease was first diagnosed or since symptoms were first noted—canvassed families in 83 cities and towns in 18 States, 1935–36*

Diagnosis	Total cases with known duration		Percent of cases of each duration:									
			Completed months			Years						
	Number	Percent	Under 3	3–5	6–11	1	2	3–4	5–9	10–14	15–19	20 and over
All cases:												
Heart disease	46,953	100	4.9	4.3	7.2	9.6	11.5	14.9	20.2	11.1	7.3	9.0
Hypertension	46,479	100	4.8	4.6	7.9	11.5	14.5	18.5	21.5	10.0	3.7	2.9
Nephritis	14,824	100	8.6	6.3	9.2	9.9	10.9	14.1	18.2	10.0	5.4	7.4
Cardiovascular-renal	93,031	100	5.4	4.7	7.7	10.3	12.7	16.3	20.5	10.5	5.6	6.4
7 day disabling cases:												
Heart disease	17,732	100	11.3	9.2	15.7	11.6	9.4	11.2	15.8	6.8	4.5	4.4
Hypertension	14,107	100	12.5	11.4	20.0	11.1	8.9	11.4	14.1	6.0	2.4	2.1
Nephritis	6,881	100	16.8	11.6	17.1	11.1	7.9	9.7	13.3	5.9	3.0	3.6
Cardiovascular-renal	32,132	100	13.3	10.7	17.8	11.1	8.8	10.8	14.3	6.3	3.5	3.4
Nondisabling cases [1]:												
Heart disease	29,221	100	1.1	1.3	2.1	8.3	12.7	17.2	22.9	13.6	9.0	11.8
Hypertension	32,372	100	1.5	1.6	2.6	11.7	17.0	21.6	24.8	11.7	4.3	3.3
Nephritis	7,943	100	1.4	1.7	2.3	8.9	13.5	17.9	22.5	13.6	7.6	10.6
Cardiovascular-renal	60,899	100	1.3	1.5	2.3	9.8	14.7	19.2	23.7	12.7	6.8	8.0

[1] Including intermittent disabilities under 7 days.

Table 12 shows also distributions according to the total durations of disabling and nondisabling cases separately. The contrast is striking; of the severe heart cases with 7 or more days of disability during the study year, 16 percent had a total duration of symptoms of 10 years or longer, as compared with 34 percent for nondisabling cases. Similarly large differences appear for the other diagnoses with respect to long cases. The percentages of cases lasting 10 years or longer are: hypertension, 10 and 19 percent for disabling and nondisabling, respectively; nephritis, 12 and 32 percent; and cardiovascular-renal, 13 and 27 percent. Relative differences are also large for cases lasting 20 years or longer: 4.4 percent of disabling heart cases had a duration of 20 years or longer, as compared with 11.8 percent of nondisabling cases. Corresponding figures for the other diagnoses for disabling and

nondisabling, respectively, were: nephritis, 3.6 and 10.6 percent; cardiovascular-renal, 3.4 and 8.0 percent; and hypertension, the smallest difference, 2.1 and 3.3 percent. These comparisons were true for males and females taken separately, but the percentages of 10- and 20-year cases were slightly higher for females than males.

Calls by Physicians

Mean Total Calls per Case

Of all the cases with 7 or more consecutive days of disability, 88 to 90 percent in the three diagnosis groups had one or more calls by a doctor (including clinic calls) during the study year (table 13). However, the mean number of calls was not large.[10] Considering all cases of 7 or more days of disability the average number of calls during the year ranged from 12 to 14 per case which had one or more calls. With an average duration for heart diseases of 136 days of disability during the year, 13.7 calls would mean an average of about one call every 10 days of disability. Of course, what really happens is that there are a number of calls in the serious stages of the attack with little or no attention at other times.

As already noted, the cases with onset of disability prior to the study year had the longest duration of disability within the study year, and they had the largest number of calls, averaging 19 to 21 for the three diagnoses. Cases with an onset of disability during the study year averaged about one-half of the number of calls for those with prior onset. Although a smaller average number of days of disability would account for part of this situation, the large number of such attacks that were fatal within the first 24 hours would also account for fewer calls by doctors. In terms of disability, the heart attacks with onset within the year averaged a little less than one-fourth of the days of disability within the study year for cases with onset of disability prior to the study year. Thus the frequency of calls in relation to the average days of disability was greater for new attacks than for the older cases that entered the study in a disabled condition.

The average number of calls per case with one or more calls tends to increase slightly with age, but there are many exceptions.

Mean Home Calls per Case

A high proportion of the severe cardiovascular-renal cases had home calls by a doctor. Of all the heart cases with 7 or more consecutive days of disability, 72 percent had one or more home calls; hypertension cases, 74 percent; nephritis cases, 67 percent; and the total cardio-

[10] Calls by the full-time hospital staff were not recorded in this survey because of the difficulty of getting any estimate of such calls. However, such cases are counted in table 1 as attended cases.

vascular-renal group, 71 percent. In general more females had home calls than males; 77 percent of the heart and 77 percent of the hypertension female patients had one or more home calls, as compared with 67 and 70 percent, respectively, of the male patients. As age increased the proportion of heart patients who had a home call

Table 13. *Mean calls by doctor during study year per case of specified diagnosis and type—canvassed families in 83 cities and towns in 18 States, 1935–36*

[Cases disabled for 7 consecutive days or longer [1] during study year]

	Total cases of given type				Cases with onset within study year			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
Cases with any calls: [2]								
All ages:								
Both sexes	13.7	12.6	12.0	12.6	10.7	10.3	9.7	10.2
Male	14.0	13.1	12.6	13.1	10.7	10.6	10.2	10.5
Female	13.4	12.2	11.5	12.3	10.7	10.0	9.4	10.0
Both sexes:								
Under 20	11.8	10.9	9.6	10.7	10.1	10.2	8.8	9.5
20–44	13.0	12.1	10.6	11.7	9.9	9.5	8.8	9.3
45–64	14.9	13.6	13.1	13.6	11.5	10.9	10.0	10.8
65 and over	13.1	11.9	13.4	12.4	10.4	9.9	11.1	10.2
Cases with home calls:								
All ages:								
Both sexes	11.8	10.9	10.2	10.8	9.6	9.2	8.3	9.1
Male	11.8	11.1	10.7	11.0	9.6	9.4	8.8	9.2
Female	11.8	10.8	9.8	10.7	9.7	9.1	7.9	8.9
Both sexes:								
Under 20	11.1	11.3	8.0	9.7	9.4	10.9	7.5	8.6
20–44	10.0	8.7	7.3	8.5	7.9	7.1	6.2	7.0
45–64	12.5	11.2	11.2	11.3	10.1	9.3	8.6	9.4
65 and over	11.9	11.0	12.3	11.4	9.9	9.4	10.5	9.7

	Cases with onset prior to study year				Percent of 7 or more day cases [1] which had 1 or more calls during year			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
Cases with any calls: [2]								
All ages:								
Both sexes	21.1	19.5	20.7	20.0	89.7	80.4	8.84	88.8
Male	20.6	18.8	20.0	19.4	87.2	87.5	87.9	86.8
Female	21.7	20.1	21.5	20.6	92.2	90.9	88.8	90.5
Both sexes:								
Under 20	17.6	15.5	18.4	17.1	86.3	77.1	89.7	86.7
20–44	21.9	22.5	22.7	21.7	87.4	84.5	86.8	86.4
45–64	23.4	22.0	23.7	22.2	89.7	89.2	88.5	88.9
65 and over	19.1	17.3	18.0	17.8	91.5	91.1	89.4	90.4
Cases with home calls:								
All ages:								
Both sexes	18.1	16.4	17.3	16.7	72.1	74.1	67.4	70.8
Male	17.3	15.6	16.5	16.0	66.9	69.9	64.1	66.1
Female	19.0	17.1	18.2	17.5	77.1	77.1	70.2	74.7
Both sexes:								
Under 20	17.3	14.6	13.2	15.6	63.2	46.7	64.0	61.7
20–44	17.3	16.8	14.9	16.1	61.2	58.4	58.3	59.4
45–64	19.6	17.6	20.9	18.0	70.3	70.4	68.9	69.4
65 and over	17.2	15.6	16.1	16.1	80.5	81.4	77.0	79.5

[1] Includes cases disabled on the day of the visit, deaths before the seventh day, and hospital cases disabled for less than 7 consecutive days.

[2] Includes clinic cases but excludes hospital in-patients with care by full-time hospital staff only. Figures given elsewhere (table 1) for percentages with any attendant include such hospital cases.

increased from 63 and 61 percent for the two age groups under 45 years to 81 percent for those 65 and over. Hypertension increased regularly from 47 percent with a home call for patients under 20 years to 81 percent for those 65 and over. Nephritis, like heart disease, showed a higher percentage with home calls for patients under 20 years than at 20–44 but otherwise showed a regular increase with age.

For the group of patients who had home calls, the mean number during the year was not greatly different from total calls. In heart cases those with one or more home calls had an average of 11.8 during the year, as compared with 13.7 total calls for heart patients. Similar figures for hypertension are 10.9 home calls per case as compared with 12.6 total calls, and for nephritis 10.2 home calls per case as compared with 12.0 total calls. The nearness of these two figures does not indicate that most of the calls were home calls but rather that the severe cases with home calls had about as many such calls as the average for all home and office calls for the whole group of patients.

Of the total calls by doctors during the study year for heart patients with 7 or more consecutive days of disability, 69 percent were home calls. Corresponding percentages for the other diagnosis groups were: hypertension 72, nephritis 65, and for the whole cardiovascular-renal group 68 percent.

Distribution of Cases According to Calls

Table 14 shows distributions of cases disabling for 7 consecutive days or longer according to the number of doctors' calls received during the study year. The averages are fairly small and there is great variability around those means. Of the total heart cases, 8 percent received 40 or more calls, but 14 percent received only 1 call and another 10 percent had no calls. Of the total hypertension cases, 7 percent had 40 or more calls, and 14 percent had only 1 call; and of the total nephritis cases, 6 percent had 40 or more calls, and 12 percent had only 1 call. Sudden deaths and cases attended only by the full-time hospital staff may account at least in part for the cases with no calls. (See footnote 10 for details.)

Table 14 shows also the distribution of patients according to the number of home calls which they had during the year. Of all heart patients with 7 consecutive days or more of disability, 28 percent had no home calls and another 13 percent had only one home call. On the other hand, 26 percent had 9 or more home calls, and 5 percent had 40 or more home calls during the year. The figures for hypertension are practically the same as for heart disease. However, more nephritis cases had a smaller number of home calls; 33 percent had none, and 12 percent had only one home call; but 21 percent had 9 or more calls, and 4 percent had 40 or more home calls.

Table 14. *Distribution of cases of the specified diagnosis according to total and home calls by doctor during the study year—canvassed families in 83 cities and towns in 18 States, 1935–36*

[All cases disabled for 7 consecutive days or longer[1] during year]

Number of calls	Total calls[2] by doctor (clinic, office, home)				Home calls by doctor			
	Heart disease	Hypertension	Nephritis	Cardiovascular-renal	Heart disease	Hypertension	Nephritis	Cardiovascular-renal
Number of cases								
Total[3]	17,782	14,138	6,904	32,209	17,782	14,138	6,904	32,209
None	1,827	1,494	801	3,593	4,965	3,666	2,249	9,413
1	2,525	1,916	827	4,379	2,359	1,856	815	4,199
2	1,471	1,207	678	2,866	1,449	1,273	646	2,860
3	1,262	1,130	591	2,530	1,222	1,032	519	2,315
4	1,148	935	489	2,138	1,024	835	408	1,853
5	837	688	382	1,543	654	642	262	1,270
6–8	1,953	1,619	799	3,660	1,476	1,190	534	2,602
9–11	1,159	1,013	484	2,169	908	808	331	1,632
12–14	1,088	889	352	1,919	710	613	228	1,254
15–19	990	779	347	1,738	612	506	193	1,055
20–24	907	642	313	1,513	681	485	212	1,100
25–29	532	358	188	867	332	224	119	516
30–39	634	491	230	1,063	437	329	122	684
40–59	800	555	240	1,282	502	386	144	811
60 or more	649	422	183	949	451	293	122	645
Percent of cases								
None	10.3	10.6	11.6	11.2	27.9	25.9	32.6	29.2
Only 1	14.2	13.6	12.0	13.6	13.3	13.1	11.8	13.0
2–8	37.5	39.5	42.6	39.5	32.8	35.2	34.3	33.8
9 or more	38.0	36.4	33.8	35.7	26.1	25.8	21.3	23.9
40 or more	8.1	6.9	6.1	6.9	5.4	4.8	3.9	4.5

[1] Includes cases disabled on the day of the visit, deaths before the 7th day, and hospital cases disabled for less than 7 consecutive days.
[2] Clinic calls are counted like any other calls; in-patients attended by full-time hospital staff only are counted as having no calls; all such calls are excluded from the whole table.
[3] Excludes a few cases unknown as to whether there were calls.

Seasonal Variability

Figure 13 illustrates the seasonal variability in cardiovascular-renal cases and deaths (table 15). The cases are confined to those with the onset of disability within the study year and are classified according to the month of onset of disability. Because of considerable random fluctuations, the data as plotted in this chart are three-period moving averages of the percentages of cases in each month, all months being reduced to a 30-day basis. Table 15 shows actual percentages before moving averages were applied. On the left of figure 13 it may be seen that there is considerable seasonal variation in the onset of disability in cases, but there is little difference between heart, hypertension, and nephritis in this respect. In all three diseases the peak of the cases comes in December or January with May to August representing the lowest part of the curves.

Just below the case data in figure 13 are deaths for the entire United States plotted on the same basis; the deaths are classified by month of death rather than month of onset of disability. Again the seasonal pattern of the three diseases is almost identical, but the monthly

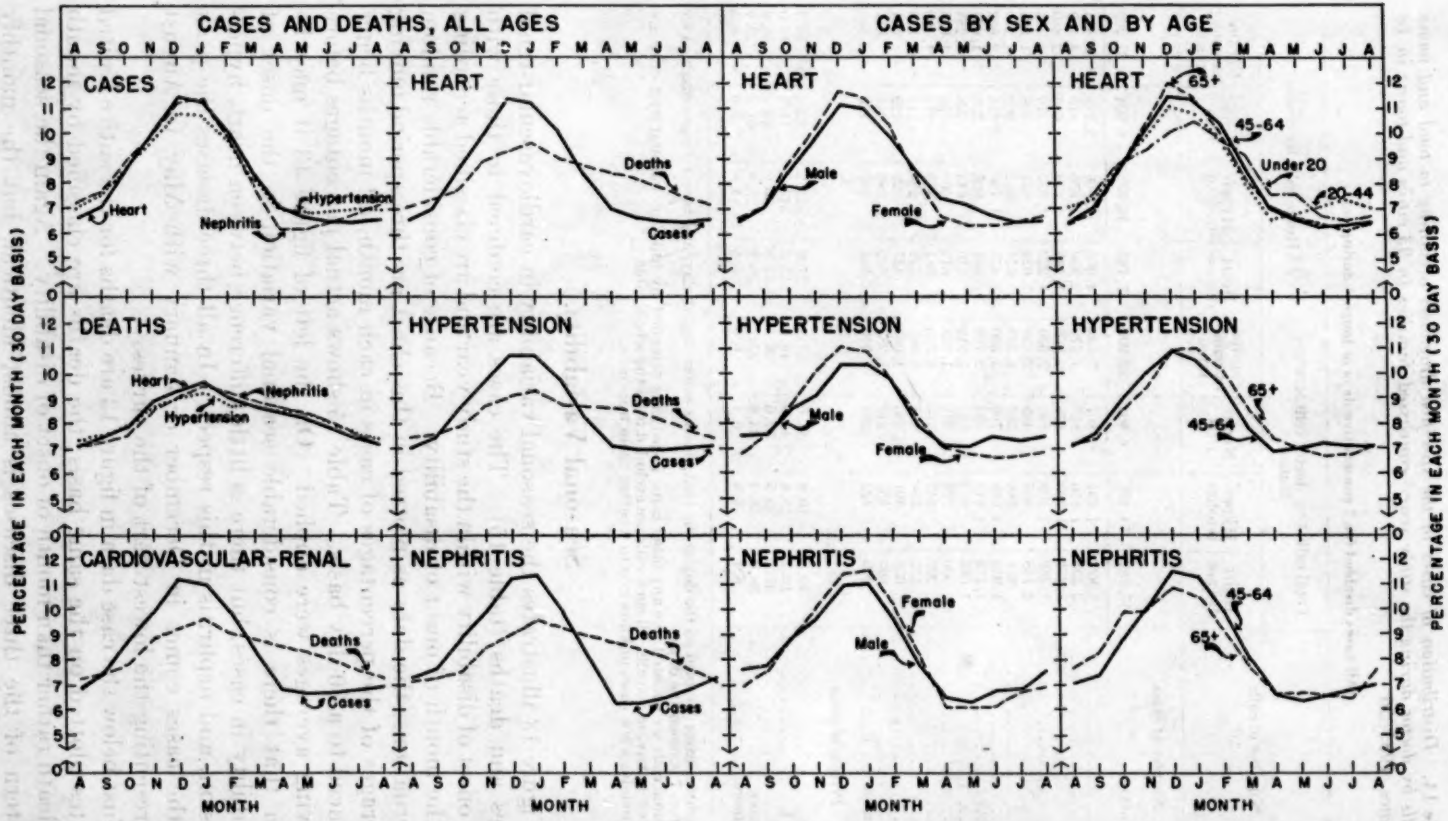

Figure 13. Seasonal variation in onset of disability of survey cases with disability beginning during the study year (1935–36), and of deaths registered in the United States, 1945 (data plotted are 3-period moving averages of actual monthly percentages, 30-day basis, in table 15).

variation in deaths is considerably less than in cases. The seasonal variation in heart deaths ranges from 7.2 percent occurring in August to 9.6 in the peak month of January. This may be compared with a variation in heart cases from a low of 6.4 in July to a peak of 11.5 percent in December.

The right half of figure 13 compares the seasonal variation of cases among males and females, and of cases at different ages. With respect to sex there appear to be no large differences, but in each of the three diseases there is somewhat more seasonal variability among females than males. With respect to age, in heart disease the ages under 20 years show the least seasonal variability and the ages above 45 show the greatest variability, the ages 20–44 years being somewhat intermediate. Moreover, the peak for the age group under 20 years comes in January, whereas the peak in the other three curves comes in December. Heart disease under 20 years, except for congenital heart, would be largely rheumatic; a preceding study (*5*) indicated less seasonal variability in rheumatic heart deaths than in rheumatic fever cases.

The number of cases of hypertension and nephritis under 45 years was not sufficient to give reliable seasonal curves so that only the two age groups above 45 are shown. In hypertension the amount of seasonal variation is approximately the same for the two age-groups, but the curve for those 65 and over has a peak in January as compared with a December peak for those 45-64 years of age. Nephritis shows less seasonal variation in the oldest age group, but the peak comes in December for both ages.

Economic Status

A preceding publication based on this survey (*2*) included a study of the variation with family income in the volume of disability from a large number of diseases. Volume of disability refers to the days of disability due to the given disease per 1,000 surveyed population. Among the diagnoses was cardiovascular-renal diseases but without a break-down of the three diseases in the group. The age-adjusted disability rate for cardiovascular-renal diseases in the group of families on relief was 2.7 times the rate for families with an income of $3,000 or more. The rate for nonrelief families with an income of less than $1,000 was 1.6 times the rate for families with $3,000 and over. The other three income groups from $1,000 to $3,000 had rates that fell logically between the rates for these extremes.

For chronic diseases of the types included in the cardiovascular-renal group, the higher rates in the poorer groups are apparently due to a variety of circumstances. Considering all cases prevalent during the study year, the high disability rate in the low income and

Table 15. *Seasonal variation in heart disease, hypertension, nephritis, and cardiovascular-renal cases* [1] *in the surveyed population, and deaths* [1] *in the general population of the United States*

	Total cases		Percentage [2] in each month (30-day basis)											
	Number	Percent	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Heart disease														
Cases, onset within year: [3]														
All ages:														
Both sexes	12, 531	100	12.4	10.1	7.8	7.1	6.1	6.9	6.5	5.9	7.3	7.9	10.8	11.1
Male	5, 771	100	12.1	9.8	7.8	7.7	6.7	7.0	6.4	6.0	7.3	7.8	10.5	10.9
Female	6, 760	100	12.7	10.2	7.8	6.7	5.5	6.7	6.6	5.9	7.3	8.0	11.1	11.3
Both sexes:														
Under 20	918	100	11.0	10.1	8.3	8.8	5.6	8.2	6.4	5.1	8.7	8.8	8.8	10.1
20–44	2, 241	100	12.1	10.2	7.3	6.5	6.0	7.9	7.3	6.7	7.0	8.2	10.9	10.1
45–64	4, 799	100	12.7	10.4	7.9	7.3	5.7	6.5	6.7	5.8	7.0	8.2	10.8	10.9
65 and over	4, 573	100	12.6	9.6	7.8	6.9	6.5	6.5	6.1	5.8	7.5	7.3	11.2	12.1
Deaths in United States: [4]														
All ages; both sexes	424, 328	100	9.2	9.1	8.7	8.3	8.3	8.0	7.3	7.1	7.2	8.0	8.3	10.5
Hypertension														
Cases, onset within year: [3]														
All ages:														
Both sexes	10, 277	100	11.7	9.8	7.6	7.0	6.5	7.1	7.2	6.5	7.5	8.5	10.1	10.4
Male	4, 072	100	12.1	9.4	7.7	6.8	6.8	7.6	8.1	6.3	8.0	8.3	9.4	9.6
Female	6, 205	100	11.5	10.1	7.5	7.2	6.4	6.9	6.6	6.7	7.1	8.6	10.6	10.9
Both sexes:														
45–64	4, 200	100	11.5	9.8	7.1	6.6	6.9	7.3	7.3	6.7	7.0	9.0	10.6	10.1
65 and over	4, 753	100	12.3	9.9	8.1	7.5	6.5	6.6	6.7	6.4	7.9	7.8	9.6	10.5
Deaths in United States: [4]														
All ages; both sexes	129, 144	100	9.0	8.8	8.5	8.8	8.4	8.2	7.5	7.3	7.3	8.0	8.3	9.8

	Total cases		Percentage[2] in each month (30-day basis)											
	Number	Percent	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Nephritis														
Cases, onset within year:[1]														
All ages:														
Both sexes	5,402	100	11.9	11.2	6.6	6.2	6.0	6.5	6.9	7.0	7.8	8.2	10.8	10.9
Male	2,327	100	11.5	10.5	6.8	5.9	6.7	6.6	7.3	6.8	8.7	7.9	10.3	11.1
Female	3,075	100	12.2	11.7	6.4	6.4	5.5	6.4	6.6	7.2	7.1	8.4	11.2	10.8
Both sexes:														
45–64	1,660	100	12.4	10.7	6.4	6.9	6.3	5.9	7.3	7.0	6.9	8.3	11.2	10.7
65 and over	1,231	100	10.8	9.8	6.6	6.6	6.7	6.5	6.5	6.3	10.2	8.2	11.0	10.8
Deaths in United States:[1]														
All ages; both sexes	88,078	100	9.4	9.4	8.9	8.4	8.7	8.2	7.4	7.1	7.0	7.8	8.0	9.7
Cardiovascular-renal diseases														
Cases, onset within year:[1]														
All ages:														
Both sexes	23,744	100	12.0	10.2	7.5	6.8	6.1	7.0	6.8	6.5	7.4	8.3	10.7	10.8
Male	10,181	100	11.6	9.9	7.6	7.0	6.5	7.4	6.9	6.4	7.7	8.2	10.4	10.4
Female	13,563	100	12.2	10.4	7.4	6.7	5.8	6.7	6.6	6.6	7.1	8.4	10.9	11.1
Both sexes:														
Under 20	1,783	100	11.8	11.1	7.2	8.3	5.8	7.9	5.9	5.6	8.6	8.3	9.2	10.3
20–44	4,760	100	11.7	10.5	7.0	5.9	5.6	7.4	7.4	7.3	7.0	8.6	10.8	10.7
45–64	8,887	100	11.9	10.2	7.4	6.9	6.1	6.9	7.1	6.7	6.8	8.7	10.9	10.4
65 and over	8,314	100	12.2	9.8	7.9	7.0	6.4	6.7	6.2	6.1	8.0	7.8	10.7	11.3
Deaths in United States:[1]														
All ages; both sexes	641,550	100	9.2	9.1	8.7	8.4	8.4	8.1	7.3	7.1	7.2	8.0	8.3	10.2

[1] Cases include only those with onset of disability within the study year 1935–36, classified by month of onset of disability; deaths are for 1945, and are classified by month of death.

[2] Percentages in this table are unsmoothed, but those plotted in figure 13 are 3-period moving averages of these percentages.

relief groups is undoubtedly due in part to loss of income resulting from the presence of the disease, particularly if the wage-earner of the family is the patient. Thus, the chronic disease caused the low income rather than otherwise. On the other hand, occupations involving hard labor would play a part in causing greater disability from heart and related diseases in the lower income groups both as a result of greater strain on the normal heart and as a result of more frequent inability to be about their usual occupations than in the case of desk workers for whom the physical strain is a minimum.

Summary

Although heart disease and other cardiovascular-renal diseases are easily the most important causes of death in the United States, there are few detailed morbidity data on these diseases. Therefore, it seemed worth while to analyze such data from the National Health Survey of 1935–36 in the light of present-day mortality data, and to estimate the numbers of cases of the different diseases in the United States.

The National Health Survey of 1935–36 covered 2,500,000 persons by house-to-house canvass and recorded a total of 93,733 cardiovascular-renal cases, both disabling and nondisabling. For purposes of analysis these cases are divided into heart disease, hypertension, and nephritis. Each group includes all persons who were reported as having the given disease, but the cardiovascular-renal total represents an unduplicated count by excluding patients who had two or more of the three diseases from all but the disease considered to be the principal cause of the illness.

Each of the diseases is divided into several categories, including cases disabling for 7 consecutive days or longer, subdivided into those with (*a*) onset of disability prior to the study; (*b*) onset of disability within the study year but with a history of a previous attack; and (*c*) new cases with no history of any previous experience with the disease. In the disabling group there is also a small number of cases that were not disabled as much as 7 consecutive days during the year, but suffered intermittent disabilities of less than 7 consecutive days. The remainder of the cases represent those without disability during the study year, subdivided into those with (*a*) some restriction of their activities with respect to the type of work they could do, and (*b*) no disability and no restriction of activity.

Case rates for hypertension show the greatest variation with age and those for nephritis the least variation with age (fig. 3).

Relative age curves for all disabling cases and for new cases (no history of previous attack) of 7 or more consecutive days of disability are not greatly different, but the level of the rates is quite different.

These two categories and also the death rates increase to a maximum at the oldest ages—85 years and over. The nondisabling cases decrease in the oldest ages, presumably because more of them progress into the severe disabling category which continues to a maximum at the oldest ages. Cases with some restriction of activity but not actually disabled, and those with intermittent disabilities of less than 7 consecutive days also decrease in the oldest ages (fig. 4).

Considering the relative importance of the three specific diagnoses in the whole cardiovascular-renal group, heart disease, particularly in the middle and older ages, is considerably more important as a cause of mortality than as a cause of morbidity. Considering specific ages, the proportion of the total cardiovascular-renal category that is charged to nephritis is not extremely different for illness and mortality; however, hypertension is relatively less important as a cause of death than as a cause of illness (figs. 1 and 2).

Hypertension shows the largest percentage of cases that were without disability or restriction of activity throughout the study year, and nephritis shows the smallest proportion of cases in this nondisabling category (figs. 5, 6, 7, and 8).

The total recorded case rates (disabling and nondisabling) are considerably higher among females than males. The relative excess of the female rate is less for the 7-day disabling cases than for the total; for new cases disabling for 7 consecutive days or longer, the rates for males are consistently above those for females in the older adult ages. The above applies particularly to heart disease and nephritis, although hypertension rates tend to vary in the same way (fig. 9).

Death rates for heart disease, based on registered deaths in the entire United States in 1945 and 1946, are definitely and consistently higher for males than females above the age of 15 years; the maximum relative difference occurs at 50–54 years with a gradual decrease in the relative excess of rates for males above and below those ages. For hypertension, the sex differences in the rates are definitely less and not consistent in the several age groups. For nephritis, the differences are not consistent until about 45 years of age after which males have moderately and consistently higher rates than females (fig. 10).

The proportion of heart disease and hypertension deaths that occurred within 24 hours of the onset of the disabling attack amounted to 21 and 16 percent, respectively, for persons of all ages and both sexes. The proportion of sudden heart deaths was definitely higher for males than females but both curves reached a peak at 45–54 years of age, with a high percentage also among children under 5 years of age (fig. 11).

Considering cases with the onset of disability within the study year, there was more seasonal variation in the cases of each diagnosis than in the deaths from the same diagnosis. The seasonal variation did not differ greatly for males and females or in the several age groups (fig. 13).

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APPENDIX

Completeness of Cardiovascular-renal Cases as Recorded in the National Health Survey

In a group of 10 cities [11] of 100,000 or more population, a detailed tabulation of National Health Survey data was made to compare the diagnosis as reported by the household informant with that supplied by the attending physician, clinic, or hospital on a special form of inquiry sent to such attendants. There were 16 special forms of this kind, the one sent depending upon the diagnosis reported by the family. The questions included more than a request to state whether the family diagnosis was correct. Every form asked also for any complicating diagnoses. Furthermore, many of the forms for chronic disease had queries about the presence of other specific diagnoses and complications. Thus, the form for heart, hypertension, and arteriosclerosis cases included specific questions about the presence of all three of these conditions and also about cerebral hemorrhage and nephritis. Similar questions appeared on the form for nephritis and kidney diseases about the presence of heart disease, hypertension, arteriosclerosis, and other complications.

[11] Boston, New York City, Syracuse, Cleveland, Minneapolis, St. Louis, Birmingham, Salt Lake City, Los Angeles, and Portland, Oreg.

A comparison of the informant's report and the doctor's diagnosis for cases on which medical reports were returned with sufficient information for coding revealed the following: For heart disease (all types combined) the physicians indicated in 91 percent of such diagnoses that the report was correct; for the hypertension group the reports indicated that 93 percent were correct, but for nephritis and kidney diseases only 68 percent were indicated as correct. Considering all three diagnoses grouped in this study as cardiovascular-renal diseases, 89 percent of the sample of cases on which codable reports were received were indicated as the correct diagnosis.

If the question of diagnosis is carried further to indicate for heart cases whether the particular type of heart disease was correctly specified, the percentage correct was much smaller. However, it would not be expected that the family informant would be able to report whether the heart condition was arteriosclerotic, hypertensive, congenital, syphilitic, or thyrotoxic, nor to be able to report whether the manifestation was endocarditis, myocarditis, pericarditis, coronary disease, or some other category. For these and other reasons the study is confined entirely to heart diseases of all types combined. Rheumatic heart disease, chiefly among children, has been considered in an earlier publication (*5*), but heart cases of rheumatic origin are also included in the present study.

The data from these medical reports are useful in another important respect, namely, to estimate the completeness of the reports of these chronic cardiovascular-renal diseases. As noted above, the medical attendant for the case was asked to indicate not only whether the diagnosis was correct, but also to add any other diagnoses and complications for this particular patient, the important and frequent complications being requested by name. For chronic cardiovascular-renal diseases this meant, for example, that a physician might have added to a report for heart disease that the patient also had hypertension, or nephritis, or both; such additional chronic disease reports may have been listed also for acute diseases if the patient failed to report the chronic condition. These added diagnoses for heart disease, hypertension, and nephritis were tabulated from the codable medical reports received in the 10 large cities and were found to constitute rather large proportions of the respective diagnoses reported by the family. For heart disease the additional reports of that diagnosis amounted to 66 percent of the 2,902 heart cases reported by the family and with codable reports returned by the medical attendants.

Some further detail should be given about medical reports. Requests for such information were sent to medical attendants for all cases attended within 12 months of the canvass, unless permission for such requests had been refused by the family; refusals amounted to only a few percent of all schedules. Fol-

lowing is a summary of the raw data on cases of cardiovascular-renal diseases in the 10 large cities for which medical reports were used in the coding.

Diagnosis	Numbers in the 10 large cities						
	Cases for which confirmation was requested	Cases for which replies were received	Replies usable in coding	Medical report		Total attended cases	Total cases reported by family
				Incorrect diagnosis	This diagnosis added to another report		
Heart disease	7,483	3,303	2,902	255	1,927	8,870	13,090
Hypertension	6,526	2,937	2,441	160	1,907	7,967	12,255
Nephritis	2,217	896	831	266	735	2,667	3,988
Total, cardiovascular-renal	16,226	7,136	6,174	681	4,569	19,504	29,333

A few percentages based on this table may be worth examination. Considering for the 10 large cities all cardiovascular-renal diagnoses for which data were requested from the attendant, 44 percent were returned (40 to 45 in the three diagnoses); of those returned, 87 percent were sufficiently clear and complete to use in coding (83 to 93 in the three diagnoses). This means a return of 38 percent when only usable reports are considered (37 to 39 percent for the three diagnoses). About two-thirds of the total cases were attended sometime during the study year (nearly the same for each diagnosis). For 83 percent of these attended cases, a request for confirmation was sent to the medical attendant (82 to 84 percent for the three diagnoses). The replies to these requests amounted to 37 percent of all attended cases, but the usable reports consisted of 32 percent of all attended cases (31 to 33 percent for the three diagnoses) or, as noted above, 87 percent of the replies received.

Although these data may be biased in several ways, in the absence of other closely related data they seem to afford the best method of making a rough estimate of incompleteness of recording of these cardiovascular-renal cases in the survey.

However, some of the medical reports indicated that heart disease reported by the family was not the correct diagnosis. Therefore, before using these added diagnoses to compute a factor for correcting for under-reporting, diagnoses indicated by the medical attendant as incorrect were subtracted and the factor became a net correction which took account of heart cases reported by the family but not confirmed by the attending physician's report. This net correction indicated that an addition for heart disease of 58 percent of the cases reported by the family was needed to correct for under-reporting. As a result of further correction to take account of the fact that medical reports were not received for all cases in the 10 large cities and that the added diagnoses for the medical reports that were received were already counted in the total cases, the correction factor for heart cases was further reduced to 54 percent. Considering also the other diagnoses

under study in this paper, the net correction factors [12] (changed to multipliers to be applied to family reports to correct for incompleteness) were as follows: Heart diseases, 1.54; hypertension, 1.67; nephritis, 1.53; and the total cardiovascular-renal group, 1.58.

Although the unreported cases were numerous, they were probably in large part the milder ones with little or no disability during the year. No corrections are attempted in this paper except for the total cases of all ages and of all degrees of severity. The following table gives the results of applying these correction factors for incompleteness to the rates recorded in this survey, and then applying the corrected rates to the estimated population of the United States of 149,200,000 as of July 1, 1949.

Recorded and estimated rates and numbers of prevalent cases of cardiovascular-rena diseases

	Heart disease	Hypertension	Nephritis	Total cardiovascular-renal (unduplicated)
Recorded case prevalence per 100,000 population in National Health Survey, 1936	1,910	1,877	597	3,769
Correction for incompleteness of family reports, based on doctors' reports	1.54	1.67	1.53	1.58
Estimated corrected case prevalence per 100,000 population at time of National Health Survey, 1936	2,941	3,135	913	5,955
Correction factor for trend since 1936, based on U. S. death rates 1936–46	1.15	0.99	0.70	1.03
Estimated case prevalence per 100,000 in 1949	3,382	3,104	639	6,134
Estimated total cases prevalent in U. S. in 1949	5,000,000	4,600,000	950,000	9,200,000

Even with these large corrections for under-enumeration, the estimated case rates for these diseases fall considerably below findings based on medical examinations. In the first place, there are many persons with heart and cardiovascular-renal diseases of a mild type who themselves do not know of its existence, and probably many other cases that are not known to the family even when known to the afflicted person. Therefore, it seems worth while to compare rates found in this house-to-house canvass, corrected for under-reporting as indicated above, with those found by medical examination in several such studies. Prevalence rates for the health survey are computed in 5-year age groups, and the same is true of most of the physical exam-

[12] Corrections for incompleteness of reporting of cases in the National Health Survey by an entirely different method were made by Hailman (*18*) in a report on all chronic diseases. In that study death rates from specific diseases as recorded in the health survey and as registered in the United States for the year 1937 were compared for the three diseases here under consideration and others with high mortality rates. It was assumed that the case rates as recorded in the house-to-house canvass were as incomplete as the death rates so recorded, when the latter were compared with the registered death rates in the United States as a whole. This entirely different method produced the following figures for correction factors for incompleteness of reporting of cases for the several diagnoses—heart disease, 1.49; hypertension, 1.52; nephritis, 1.68; and cardiovascular-renal as a whole, 1.53. Thus the two sets of correction factors based on entirely different methods and assumptions are of the same order of magnitude, those based on physicians' reports being somewhat larger.

ination rates except that fewer age-groups are shown for the ages above 60 years. In the following comparisons the quoted rates represent simple averages of rates for the 5-year age groups included in the specified age span.

Among the older physical examination studies are those of the Life Extension Institute representing medical examinations of policyholders [13] after they had been insured for a number of years. An analysis of the results of the examination of about 100,000 males 20 years of age or older was made by Sydenstricker and Britten (*16*). These examinations were reported in two different groups—one made at the headquarters office of the Life Extension Institute in New York City where special equipment and detailed examinations were the rule, and the other made in all other places, designated in the study as "Field." Comparisons made here refer to the two groups combined. A simple average of the ten 5 year age-groups from 20 to 69 years indicated that 4.6 percent of those examined had organic heart diseases. This figure may be compared with 3.8 percent for the family canvass data computed in a similar way for males of the same age groups but corrected for underreporting. The Life Extension figure does not include enlarged heart or irregular and other functional heart diseases. The results of the Life Extension Institute examinations are reported in 7 different diagnoses that are included as organic heart disease, so that the total may contain some overlapping in that the same individual may have been reported as having two or more organic heart conditions.

With respect to broad age groups, the Life Extension examinations indicated 2.8 percent of males with organic heart disease at 20–44 and 6.3 at 45–69, as compared with 1.3 and 6.4 percent for the respective age groups in the family canvass data, corrected for underreporting.

A study of the results of medical examinations of 10,000 male industrial workers by Britten and Thompson (*3*) indicated an average organic heart disease rate of 4.2 percent for the ages 20–59 as compared with 2.4 percent for males of the ages 20–59 in the family canvass data, corrected for underreporting. The industrial data exclude enlarged heart and irregular and other functional heart diseases. Similar averages for organic heart among male industrial workers of the ages 20–44 and 45–59 were 3.3 and 5.7 percent, as compared with 1.3 and 4.1 percent for males of the respective ages in the family canvasses. These workers were in 10 different industries and data are available on organic heart in 7 of them. In these

[13] These examinations do not include the original one to determine whether the applicant was acceptable for insurance.

7 industries the rates for organic heart disease for the ages 20–59 (average of 10-year age groups) ranged from 2.5 to 5.9 percent.

A more recent study was made of Farm Security Administration borrowers and their families (*13*) which indicated, as an average for the twelve 5-year age groups, rates for heart disease for males of the ages under 60 years of approximately 10.1 percent. The corresponding hypertension rate was 10.0 percent as set down by the examining physician and 10.7 percent as measured by blood pressure of 150 or more, systolic, and 90 or more, diastolic. All of these rates are considerably above the findings of the household canvass for the same ages, even after correction for underreporting, 1.8 and 1.4 percent for heart and hypertension, respectively.

Thus it is seen that rates found in this family canvass study are below findings of these medical examination studies with the aid of such instruments and techniques as the stethoscope, sphygmomanometer, urinalysis, and other more accurate tests for the presence of heart disease, hypertension, and nephritis. Again, one would not expect to find as many cases in household surveys as by medical examination. However, the great majority of the cases found in the survey represent individuals who were considerably disabled during the study year or at some fairly recent time in their lives. Approximately half of the recorded cases represent patients who were, during the study year, so sick as to be unable to work or carry on other usual activities for a period of 7 consecutive days or longer; thus they represent, in the main, severe disabling sickness rather than murmurs and signs of heart disease that had not yet given the patient serious trouble.

Although the most recent data on medical examination findings are those from the Selective Service (*15*), they are restricted to such a narrow age range that comparison must be limited to those few ages. Insofar as comparable diagnoses were obtainable, it appears that the Selective Service reports indicated rates far above the family canvass data.

Some further comparisons of rates and of sex differences in rates were discussed in the body of this report and need not be repeated here.

INCIDENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 29, 1949

A total of 1,071 cases of poliomyelitis was reported for the week, a decline of 77 cases (7 percent), as compared with last week's decline of 59 cases (5 percent), and 248 cases (23 percent), for the corresponding week last year. The corresponding 5-year (1944–48) median total was 581 cases. A combined increase of 48 cases was reported this week in the New England, Middle Atlantic, South Atlantic, and East South Central areas, all of which, however, last week reported a combined decline of 64 cases. The 17 States reporting currently more than 20 cases are as follows (last week's figures in parentheses): *Increases*—Connecticut 34 (17), New York 152 (138), Pennsylvania 39 (36), Ohio 57 (52), Indiana 29 (22), Minnesota 62 (40), Maryland 24 (14), Kentucky 29 (18), Tennessee 22 (15); *decreases*—Massachusetts 45 (51), New Jersey 52 (58), Illinois 53 (63), Michigan 50 (67), Wisconsin 38 (43), Oklahoma 23 (31), Texas 35 (57), California 68 (98).

The total for the year to date is 38,153, as compared with 23,418 for the same period last year and a 5-year median of 17,437. The 8 States reporting the largest numbers for the 32-week period since March 19 are as follows (last year's corresponding figures in parentheses): New York 5,052 (1,285), Illinois 2,689 (1,006), Michigan 2,548 (656), Texas 2,032 (1,590), California 1,866 (4,118), Minnesota 1,739 (1,153), Massachusetts 1,705 (178), Ohio 1,655 (1,065).

During the week, New York and Pennsylvania reported 1 case each of anthrax, West Virginia 1 case of rabies in man, and California 1 case each of psittacosis and relapsing fever.

Cumulative figures (other than for poliomyelitis) since the respective weeks of seasonal low incidence are below the corresponding 5-year medians for all of the 9 diseases for which data are available, and since the first of the year for all except infectious encephalitis, measles, poliomyelitis, Rocky Mountain spotted fever, and tularemia.

Deaths recorded during the week in 94 large cities in the United States totaled 9,068, as compared with 8,887 last week, 9,152 for the corresponding week last year, and a 3-year (1946–48) median of 8,928. The total for the year to date is 393,581, corresponding period last year 395,095. The cumulative figure is 28,120, corresponding period last year 28,701.

Telegraphic case reports from State health officers for the week ended October 29, 1949

[Leaders indicate that no cases were reported]

Division and State	Diphtheria	Encephalitis, infectious	Influenza	Measles	Meningitis, meningococcal	Pneumonia	Poliomyelitis	Rocky Mt. spotted fever	Scarlet fever	Smallpox	Tularemia	Typhoid and paratyphoid fever	Whooping cough	Rabies in animals
NEW ENGLAND														
Maine				21		1	6		6				3	
New Hampshire							3							
Vermont				1			10		2				7	
Massachusetts	4			26	2		45		30				95	
Rhode Island						6	6		7				14	
Connecticut				23	2	23	34		13			1	61	
MIDDLE ATLANTIC														
New York	9	1	[2]1	30	4	160	152		[4]37				187	11
New Jersey	1		5	14	3	52	52		13				126	1
Pennsylvania	3			33	7	55	39		23			3	152	2
EAST NORTH CENTRAL														
Ohio	3		3	14	5	63	57		99		1	6	82	6
Indiana	6		5	8	2	3	29		19				15	15
Illinois	1	2	4	13	6	119	53		21			1	110	2
Michigan [3]	2	2	2	71	4	23	50		45			3	77	3
Wisconsin	2		7	27		3	38		28			1	50	
WEST NORTH CENTRAL														
Minnesota	4			10		2	62		15				6	
Iowa				18	1	1	12		10				2	1
Missouri	3		1	1		2	19		8			3	7	
North Dakota			1	4			2						3	
South Dakota		1		7	1		12							
Nebraska			9	6		3	19		11				1	
Kansas				4		12	16		23		1	1	18	
SOUTH ATLANTIC														
Delaware				1					10				8	
Maryland [3]	4		1	19		20	24		11				40	
District of Columbia	1			5	1	11	7		7					
Virginia	9		147	6		46	9		18			1	17	4
West Virginia	6		12	4	2	3	6		14			3	14	
North Carolina	31			6	1		1	1	76		1		23	
South Carolina	13		10	4		10	1		6			1	1	1
Georgia	22		1	1	1	9	9		30			1	2	10
Florida	2		2	12		13	8		3		1	1	6	

EAST SOUTH CENTRAL													
Kentucky	30		1	4	4	97	29	1	57			3	4	14
Tennessee	12	1	15	6	1	31	22		62			1	33	
Alabama	21		3	6	1	23	6		24		1	1	10	7
Mississippi [a]	17		1	3	1	14	3		13		1	2	6	
WEST SOUTH CENTRAL														
Arkansas	3		47	3	2	29	13		2		1	1	15	
Louisiana	6			1		19	2		4			2	1	
Oklahoma	5		62	3	1	18	23		9		1	1	7	1
Texas	15	6	939	18	7	233	35		21		2	8	59	8
MOUNTAIN														
Montana			5	34	1		4		4		1	1	3	
Idaho			21	3		5	17		[d] 17				3	
Wyoming				11			1		3					
Colorado	1	1	21	5	1	20	19		12			1	2	
New Mexico				2		5	3		2			1	5	
Arizona			112	15		10	3		1			2	4	
Utah [a]				57		1	12						16	
Nevada														
PACIFIC														
Washington	2			30			17		27				10	
Oregon	1		5	6		11	13		18			1	17	
California	12	2	15	41	5	27	68		[d] 69			9	93	
Total	251	16	1,458	637	66	1,183	1,071	2	930		11	60	1,415	
Median, 1944–48	401	12	1,576	1,190	77		581	1	1,666	6	8	74	1,620	
Year to date 43 weeks	6,216	663	86,682	592,961	2,841	64,938	[1] 38,153	549	63,983	44	[1] 960	3,228	52,195	
Median, 1944–48	10,257	543	201,458	560,009	5,079		17,437	507	96,107	301	775	3,535	82,058	
Seasonal low week ends	(27th) July 9		(30th) July 30	(35th) Sept. 3	(37th) Sept. 17		(11th) Mar. 19		(32nd) Aug. 13	(35th) Sept. 3		(11th) Mar. 19	(39th) Oct. 1	
Since seasonal low week	2,448		10,815	4,443	325		[1] 37,237		5,723	3		2,768	5,593	
Median, 1944–45 to 1948–49 [b]	4,286		11,795	5,767	413		17,174		9,812	27		3,060	6,183	

[a] Period ended earlier than Saturday.
[b] The median of the 5 preceding corresponding periods (1944–45 to 1948–49).
[c] New York City only.
[d] Including cases reported as streptococcal infection and septic sore throat.
[e] Including paratyphoid fever; currently reported separately as follows: Ohio 1, Michigan 3, South Carolina 1, Georgia 1, Texas 3, California 4. Cases reported as salmonella infection, not included in the table, were as follows: Massachusetts 10, New York 2.
[1] Poliomyelitis—Deductions: Michigan, week ended September 24, 2 cases, week ended October 8, 1 case; Missouri, week ended October 15, 1 case; Arkansas, week ended July 23, 1 case. Tularemia—Deductions: Arkansas, weeks ended September 24, and October 15, 1 case each.

Anthrax: New York and Pennsylvania, 1 case each.
Psittacosis: California, 1 case.
Rabies in man: West Virginia, 1 case.
Relapsing fever: California, 1 case.

Alaska: Measles 3, pneumonia 6.
Hawaii Territory: Measles 3, scarlet fever 3, whooping cough 1.

FOREIGN REPORTS

CANADA

Provinces—Notifiable diseases—Week ended October 8, 1949.—During the week ended October 8, 1949, cases of certain notifiable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	New found-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox			5	2	36	114	6	28	51	39	281
Diphtheria					3	6			3		12
Dysentery, bacillary					2	3	4				9
Encephalitis, infectious							4				4
German measles			2		3	8		1	11	2	27
Influenza			34			3	2				39
Measles			60		160	44	26	73	26	143	532
Meningitis, meningococcal			1	1	1	3					6
Mumps			10		21	50	5		13	53	152
Poliomyelitis			5		10	29	2	8	4	9	67
Scarlet fever				3	32	27	8	2	27	5	104
Tuberculosis (all forms)	8		5	12	80	23	13	12	12	36	201
Typhoid and paratyphoid fever					5				1	1	7
Undulant fever						1	2		2		5
Venereal diseases:											
Gonorrhea	5	1	13	4	101	76	24	8		71	303
Syphilis	5		6	4	47	22	7	14		6	111
Other forms										1	1
Whooping cough	2		1		50	32	3	1		4	93

JAPAN

Notifiable diseases—4 weeks ended September 24, 1949, and accumulated totals for the year to date.—For the 4 weeks ended September 24, 1949, and for the year to date, certain notifiable diseases were reported in Japan as follows:

Disease	4 weeks ended Sept. 24, 1949		Total reported for the year to date	
	Cases	Deaths	Cases	Deaths
Diphtheria	595	46	10,448	1,042
Dysentery, unspecified	5,396	1,561	19,975	5,580
Encephalitis, Japanese "B"	826	258	913	288
Gonorrhea	14,755		138,256	
Influenza	45		1,871	
Malaria	375	7	3,349	47
Measles	2,550		156,949	
Meningitis, epidemic	189	57	1,200	346
Paratyphoid fever	245	16	1,788	79
Pneumonia	4,162		109,013	
Scarlet fever	192	2	3,392	51
Smallpox			120	12
Syphilis	13,425		146,437	
Tuberculosis	40,435		354,292	
Typhoid fever	779	92	4,947	599
Typhus fever	2	1	92	7
Whooping cough	15,545		101,539	

NOTE.—The above figures have been adjusted to include delayed and corrected reports.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

Note.—The following reports include only items of unusual incidence or of special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Ecuador—Loja Province.—During the month of September 1949, 2 cases of plague were reported in Guachanama, Paltas County, Loja Province, Ecuador.

Netherlands Indies—Java—Jogjakarta.—During the week ended October 1, 1949, 41 fatal cases of plague were reported in Jogjakarta Residency, Java, and 7 cases, all fatal, were reported in the city of Jogjakarta during the week ended October 15, 1949.

Siam (Thailand).—For the week ended October 15, 1949, 6 cases of plague, with 4 deaths, were reported in Siam.

Smallpox

French West Africa—Niger Territory.—Smallpox has been reported in Niger territory, French West Africa, as follows: July 1–31, 1949, 48 cases, 3 deaths; August 1–31, 134 cases, 5 deaths.

Mexico.—During the week ended September 24, 1949, 22 cases of smallpox were reported in Encino, Michoacan State, Mexico, and during the period October 2–15, 10 cases were reported in the Federal District of Mexico.

Nigeria—Lagos.—Smallpox has been reported in Lagos, Nigeria, as follows: September 1–30, 1949, 79 cases, 21 deaths; week ended October 8, 28 cases, 1 death; week ended October 15, 11 cases, 3 deaths; week ended October 22, 18 cases, 3 deaths.

Peru.—During the month of July 1949, 584 cases of smallpox were reported in Peru, including 333 cases in Cajamarca Department and 126 cases in Cuzco Department.

Typhus Fever

Peru.—During the period July 1–31, 1949, 140 cases of typhus fever were reported in Peru.

Puerto Rico—San Juan.—During the period October 8–21, 1949, 4 cases of murine typhus fever were reported in San Juan, Puerto Rico.

Yellow Fever

Gold Coast—Oda Area.—Yellow fever has been reported in Oda Area, Gold Coast, as follows: On September 28, 1949, 1 suspected case in Esuboni; on October 7, 1 suspected in Bawdua.

DEATHS DURING WEEK ENDED OCT. 29, 1949

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Oct. 29, 1949	Corresponding week, 1948
Data for 94 large cities of the United States:		
Total deaths	9,068	9,152
Median for 3 prior years	8,928	
Total deaths, first 43 weeks of year	393,581	395,095
Deaths under 1 year of age	625	635
Median for 3 prior years	692	
Deaths under 1 year of age, first 43 weeks of year	28,120	28,701
Data from industrial insurance companies:		
Policies in force	70,083,885	70,838,920
Number of death claims	13,782	12,484
Death claims for 1,000 policies in force, annual rate	10.3	9.2
Death claims per 1,000 policies, first 43 weeks of year, annual rate	9.2	9.3

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